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THE INCLUSION OF FRACTURE

IN THE PUFF COMPUTER CODE

Richard J. Scammon
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TECHNICAL REPORT NO AFWL-TR-69-73

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FOREWORD

This research was performed under Program Element 61102H, Project 5710, Subtask AA 1106, and was funded by the Defense Atomic Support Agency (DASA).

Inclusive dates of research were June 1968 to May 1969. The report was submitted 6 June 1969 by the Air Force Weapons Laboratory Project Officer, Mr. A. Foster Cooper (WLRP). Former Project Officer was Captain Richard J. Scammon (WLRP).

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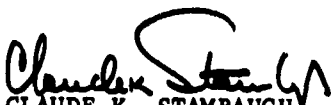
This technical report has been reviewed and is approved.

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ABSTRACT

(Distribution Limitation Statement No. 2)

This report describes in some detail the addition of a fracture routine to
PUFF 66, a one-dimensional Lagrangian hydrodynamics computer program. The
report concerns itself mainly with the logic required in creating, following,
and deleting free surfaces using a simple tension criterion for fracture plane
location.

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SECTION I

INTRODUCTION

This report describes a method of handling material fracture in PUFF 66, a one-dimensional Lagrangian hydrodynamics computer program. (The reader is referred to AFWL-TR-66-48 for a detailed description of the basic code.) The changes made to PUFF 66 are discussed and a listing of the revised program is provided, with a sample problem demonstrating the use of the modified program.

The fracture routine creates right- and left-hand free surfaces or boundaries at a location where the fracture criterion has been exceeded and then follows these surfaces as the program progresses. If the two surfaces should come in contact at some later time, they are combined, the free surfaces are deleted, and the resulting zone boundary is given a new fracture strength. This report is concerned with the code mechanics required in creating, following, and deleting the free surfaces; no attempt is made to address the question of fracture criteria. Tension is used as the fracture criterion although another criterion could be substituted with little change to the rest of the routine.

Although this report is concerned only with PUFF 66, a radiation deposition code, the same approach with minor modifications can be adopted to P PUFF 66, the flyer plate version of PUFF.

SECTION II

COMPUTER CODE IMPLEMENTATION

The insertion of a fracture or spall capability into PUFF can be separated
into two segments: (1) the criterion to be used in defining when a material
should fracture, and (2) the code mechanics used to create and follow the
free surfaces resulting from a fracture. As stated in the introduction, the
criterion used with this routine is simple tension. Once the magnitude of the
tension in an area is greater than the strength assigned to the material, the
material is considered to have spalled and the appropriate action is taken to
create and follow the resulting free surfaces. This criterion was chosen
because of its simplicity. The mechanics of handling the fracture are relatively
independent of the criterion and a more realistic criterion can be incorporated
with only minor changes to the rest of the routine.

The routine identifies fracture by comparing the zone-mass-weighted average
tension of two adjacent zones to the strength of the material attributed to the
zone boundary between the zones. If the average tension exceeds the strength
of the zone boundary, the routine creates right- and left-hand free surfaces
at the boundary. The existing zone boundary is used as the left-hand free
surface, while a new boundary is introduced to act as the right-hand free
surface. This boundary is essentially imaginary in that it does not change the
zone number of the following zones. Both surfaces are given the position and
velocity of the original zone boundary; the velocity in subsequent cycles is
calculated using the same equation used to calculate front and rear surface
velocity in PUFF 66. The resulting free surface motion is followed cycle by
cycle by a special spall path in the HYDRO subroutine and, if the two surfaces
come in contact, they are combined, the imaginary zone boundary is deleted, and
the resulting zone boundary is given a strength of zero.

The majority of the additions and changes required to incorporate the
fracture scheme into PUFF are found in the HYDRO subroutine with minor changes
in the GENRAT, REZONE, EQUATION OF STATE, and EDIT subroutines. No new sub-
routines were needed. These changes are discussed in some detail in the follow-
ing paragraphs. Four new dimensioned variables were added to PUFF 66. Two of
these, TSPALL (801) and US (100) are located in the common declaration while

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XS (100) and SM (100) are dimensioned in HYDRO. The variable, TSPALL, is the zone boundary spall strength in dynes per square centimeter and is used in several subroutines. US is the velocity of the right-hand free surface of a fracture and is used in HYDRO and in the momentum calculation of the EDIT sub-routine. The variable XS is the position of the right-hand free surfaces and SM is the storage for the momentum edit of the spalled sections calculated in HYDRO.

1. GENRAT

The material strength for the fracture criteria is read into the program in the GENRAT subroutine as part of the material data. The existing material variable PMIN is used for this purpose. It possesses the units of dynes per square centimeter and is negative in keeping with the sign convention used in PUFF. The material strength is converted to the zonal parameter TSPALL(J) at the same point in the program that GENRAT initializes the other zone variables. If PMIN is given a value of zero for a material, TSPALL(J) for the zones in that material is set to an arbitrarily large negative number which effectively locks out the spall routine in the material. An option allows the user to read in the spall strength for an individual zone boundary such as a material inter-face. The flag for this option is NSPAL which is set to the number of specific inputs desired. Each input consists of a separate card following the JEDIT input card in sequence and contains the index number of the material involved, the fractional thickness of that material at which the input is to be located, and the material strength desired at that location. The spall strength is given to the zone boundary nearest the indicated location after zoning is completed. This specific input overrides the general material input PMIN.

2. HYDRO

Subroutine HYDRO contains the majority of the changes required in incor-portating the spall routine. These are grouped for the most part into four sections: (1) the check against the fracture criterion which creates the free surfaces when fracture occurs, (2) the spall path which updates the velocity and position of the free surfaces created by fracture, (3) the combine routine which checks to see if the free surfaces have come in contact and if so deletes them, and (4) a momentum edit of the spalled regions.

As the stress of each zone is updated, the stress in that zone and the stress in the zone immediately preceding it are checked. If both zones are in tension, the zone mass weighted average of the tension in the two zones is

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calculated and this result checked against the material strength attributed
to the zone boundary between the two zones. If the tension exceeds the
boundary strength, the material is considered to have fractured at that point
and the strength of the boundary is set equal to 1.234 as a flag to mark the
fracture during the rest of the program. These zone boundaries are then
treated as left-hand free surfaces by the spall path in HYDRO when their
position and velocity are updated. The right-hand free surface is also
created at this time. Given the same initial position and velocity as the
left-hand free surface (the position and velocity for the original zone
boundary), this boundary is treated as a right-hand free surface in the spall
loop. The spall locations are indexed consecutively from left to right for
identification purposes and a check is made to update the index numbers for
spall locations to the right of the new fracture. Upon establishing a spall
location, the program provides an edit print giving the spall location, time
of spall, the zone mass weighted average of the stress of the two zones
involved, the strength at the zone boundary, and the total number of spalls
existing at that time. A flag is also set which calls for a momentum edit at
the completion of the HYDRO cycle.

The spall path in HYDRO keeps track of the free surfaces created by
fracture, calculating the velocity and position of the two free surfaces at
zones flagged by TSPALL(J)=1.234. As discussed above, the expression used to
calculate boundary velocity as a function of stress and time is the same as
that used to calculate the free surface velocity of the front and rear surfaces
in PUFF 66.

When HYDRO updates the positions of the two free surfaces of a fracture in
the spall loop, it checks to see if the surfaces have come together. If the
free surfaces have come in contact during the time step, the program "combines"
them. After combination the imaginary right-hand free surface is deleted and
the spall strength of the boundary reset. Given a strength of zero, the inter-
face may freely separate at a future time. Upon combination, the velocity of
the zone boundary replacing the two free surfaces is calculated in such a way
as to conserve momentum, and the initial position of the boundary is calculated
as a ratio of the zone masses considering the relative positions of the free
surfaces prior to combination. As with the creation of the free surfaces,
any spall locations to the right of the one being combined must be re-indexed.
An edit print provides zone number, position, and problem time at combination,
and a flag is set so that the zone is not checked for spall during that cycle.

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Before HYDRO is exited after completion of a cycle, a flag is checked to
see if a fracture occurred during the cycle. If so, an edit print routine
provides the momentum of all of the spalled regions. The momentum calculation
uses the mass of the zone and the average velocity of the two corresponding
zone boundaries.

3. REZONE

Some changes to the REZONE subroutine are necessary to keep track of
TSPALL(J), both as a variable and as a flag marking fractured zones, during
the combine and divide operations of the subroutine.

The divide section of REZONE includes these changes necessary to re-index
TSPALL(J) to the right of the divided zone. The left half of the newly divided
zone takes on the same value of TSPALL(J) as the zone to the left of it unless
that zone is a spalled zone, in which case it assumes the value that the divided
zone held originally. The right half of the divided zone keeps the value of
TSPALL(J) held by the original zone. This is done to keep individual zone
strength inputs from multiplying or spreading from their intended location
during divide (i.e., a zero zone strength input at a material interface will
remain as a value for only one zone).

In the combine loop of REZONE a check is made to see if either of the two
zones to be combined, or if the zone immediately on the left and on the right
of these two, is flagged as fractured zones. If so, that zone is bypassed and
the next zone is checked. This is necessary to conserve momentum in the
problem. The equations used to adjust the zonal parameters when combining two
zones will not conserve momentum in the region of a free surface. The spall
strength of the REZONE combined zone is the lesser of the two zones combined.
Provision is also made to re-index the TSPALL(J) variable to the right of the
combined zone.

4. EQUATION OF STATE

The only change required in the EQUATION OF STATE subroutine is the deletion
of PMIN from the equation where it was previously used to limit the tension
which a material could achieve. The equation

$$P1 = AMAX \ 1 \ (PMIN(M), \ (E1-TS1)*TS2*RHO(M))$$

was replaced by

$$P1 = (E1-TS1)*TS2*RHO(M))$$

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5. EDIT

The changes to the EDIT subroutine involve the momentum calculation which sums all of the positive and all of the negative momentum in the problem. These calculations must be corrected in the case of fractured zones to account for the free surface velocities.

SECTION III

USE OF THE MODIFIED CODE

The fracture routine has many applications such as studying the effect on shock pulse profile and momentum transfer during fracture in materials and at material interfaces. It can be combined with a routine that calculates the temperature of materials caused by energy deposition to remove front surface vapor and melt, thereby significantly improving momentum calculations. Added to the plate slap version of PUFF, the fracture routine can be used to allow the flyer plate to rebound from the target giving a more realistic treatment of flyer plate experiments.

Use of the routine is quite straightforward, requiring only a strength parameter for each material in addition to the data already required by PUFF 66. Its function can be suppressed in any material by simply setting PMIN to zero for that material. Unless a large number of fractures occur, the execution time in HYDRO and the total problem execution time are not significantly affected by the routine.

Some problems with the REZONE subroutine can be encountered when using the fracture routine. When REZONE is used to adjust the zone mesh in the vicinity of a pressure pulse, the smaller zones in the problem will normally be found in the pressure pulse. These, then, are the zones that will constrain or control the size of the time step because the time step cannot exceed the shortest shock transit time found in any zone in the problem. As the pulse progresses and attenuates, REZONE allows the zone size under the pulse to increase, thereby letting the time step increase. This in turn allows the problem to reach completion in fewer cycles. If two zones that are adjacent or in close proximity should fracture, REZONE may not be able to adequately combine the zones between them, and will produce small zones that may control the time step for the rest of the problem, significantly increasing the number of cycles and thus the computer time required to complete the problem. This is especially true for front surface fracture where the initial zoning is normally quite fine. A similar problem can be encountered for a single fracture near the front surface, since, as discussed in Section II, REZONE is not allowed to combine zones in the immediate vicinity of a fracture to conserve momentum. If the zone size in the area of a fracture is small, these zones may then control the time step.

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One possible approach to correcting the first problem is to artificially force the code to allow a certain number of zones or a certain distance between fracture locations. This, of course, will produce a corresponding loss in accuracy in fracture location. In the second case, the best solution is to modify the combine section of REZONE to allow momentum conservation while combining zones in the area of the fracture. Neither of these corrections has been incorporated into the present program.

A potential problem that should be kept in mind when using the fracture routine again concerns the REZONE subroutine. While REZONE provides a fine mesh, with correspondingly good resolution, for pressure pulses, it does not do this for tensile pulses. A tensile pulse in PUFF 66 often travels in an area where the zones are quite large, resulting in a loss of pulse resolution. Short of major reprogramming or replacement of REZONE, one correction for cases where this could be a problem is the use of uniform zoning throughout the problem. This is not satisfactory in many cases because of the increase in problem time.

The sample problem provided in Appendix II demonstrates the use of the fracture routine with its various options. The problem is a two-material problem similar to the sample problem used in the PUFF 66 technical report, run with the fracture modification. Material 1 was assigned a strength of 5×10^9 dynes/cm^2. This value is somewhat smaller in magnitude than the trailing tensile pulse at the front surface, thus providing an example of front surface fracture. The boundary between the two materials was given a strength of zero to demonstrate the option of assigning strength to individual zones, while for the second material PMIN was set to zero suppressing the fracture routine in that material. The normal PUFF output is listed with graphs of pressure versus distance at several problem times. The solid vertical straight lines in these plots indicate free surfaces while the dashed vertical line indicates a material interface. Only one free surface is marked for each fracture location. Starting with the second plot, the deviation of the sample problem run without spall is marked by a dashed line. Note that the material interface fractured before the 1.31-microsecond plot.

APPENDIX I

FORTRAN LISTING OF PUFF 66 WITH

FRACTURE CAPABILITY

```
      PROGRAM PUFF 66(INPUT,OUTPUT,TAPE6,TAPE4)
C         PUFF 66                                                     P66  10
C                                                                     P66  20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YP66  30
     107(801),ZM(801),TSPALL(801),US(100)
C                                                                     P66  50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6P66  60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)P66  70
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80P66  80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),Y0(6)             P66  90
C                                                                     P66 100
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTP66 110
     1S,JZPUL,LINE,LOZHIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NP66 120
     2TEDT,PDTNEG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE          P66 130
C                                                                     P66 140
C         ZEROES COMMON                                               P66 150
      DO 1 J=1,13037                                                  P66 160
1     CS(J)=0.                                                        P66 170
      CALL GENRAT                                                     P66 180
      N=1                                                             P66 190
2     CALL HYDRO                                                      P66 200
C         STOP PARAMETERS                                             P66 210
      IF (SMAX) 11,11,3                                               P66 220
3     IF (TIME-TS) 4,8,8                                              P66 230
4     IF (N-JCYCS) 5,8,8                                              P66 240
5     IF (X(JSMAX)-CKS) 6,8,8                                         P66 250
6     IF (SENSE SWITCH 2) 7,12                                        P66 260
7     PRINT 39, N                                                     P66 270
8     WTAPE=1.                                                        P66 280
      CALL EDIT                                                       P66 290
      IF (NJEDIT) 9,10,9                                              P66 300
9     END FILE 4                                                      P66 310
      REWIND 4                                                        P66 320
10    END FILE 6                                                      P66 330
      REWIND 6                                                        P66 340
      STOP                                                            P66 350
11    PRINT 38, N                                                     P66 360
      STOP                                                            P66 370
C         EDIT CONTROLS                                               P66 380
12    IF (NJEDIT) 13,18,13                                            P66 390
13    JB=JEDIT(1)                                                     P66 400
      IF (S(JB+1)) 14,18,14                                           P66 410
14    DO 15 I=1,NJEDIT                                                P66 420
      JB=JEDIT(I)                                                     P66 430
15    WRITE (4) JORG(I),JEDIT(I),S(JB+1),TIME,N                       P66 440
      JB=JB+1                                                         P66 450
      IF (S(JB)+Q(JB)) 16,18,17                                       P66 460
16    PDTNEG=PDTNEG+(S(JB)+Q(JB))*DTNH                                P66 470
      GO TO 18                                                        P66 480
17    PDTPOS=PDTPOS+(S(JB)+Q(JB))*DTNH                                P66 490
18    IF (MOD(N,NTAPE)) 20,19,20                                      P66 500
19    WTAPE=1.                                                        P66 510
      CALL EDIT                                                       P66 520
      GO TO 22                                                        P66 530
20    IF (MOD(N,NPRIN)) 22,21,22                                      P66 540
21    WTAPE=0.                                                        P66 550
      CALL EDIT                                                       P66 560
C         REZONE CONTROLS                                             P66 570
22    IF (JZPUL) 26,26,23                                             P66 580
23    IF (MOD(N,NREZON)) 26,24,26                                     P66 590
24    IF (JSMAX-JZPUL-JSMAXI) 26,26,25                                P66 600
```

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```
25        CALL REZONE                                         P66 610
C             TIME STEP CALCULATION                           P66 620
26        SK2M=AMIN1(.9/SK2M,1.2*DTNH)                        P66 630
          IF (SSTOPM-TIME) 28,28,27                           P66 640
27        SK2M=AMIN1(.01*SDURM,SK2M)                          P66 650
28        DTN=DTNH                                            P66 660
          DTNH=SK2M                                           P66 670
C             TIME EDIT                                       P66 680
          IF (NTEDT) 32,32,29                                 P66 690
29        WTAPE=1.                                            P66 700
          CALL EDIT                                           P66 710
          IT=IT+1                                             P66 720
          IF (IT-26) 31,30,31                                 P66 730
30        IT=1                                                P66 740
          TFDIT(1)=0.                                         P66 750
31        NTEDT=0                                             P66 760
32        IF (TEDIT(IT)) 35,35,33                             P66 770
33        IF (TIME+DTNH-TEDIT(IT)) 35,34,34                   P66 780
34        DTNH=TEDIT(IT)-TIME                                 P66 790
          NTEDT=1                                             P66 800
35        TIME=TIME+DTNH                                      P66 810
          DTN=DTN+DTNH                                        P66 820
          N=N+1                                               P66 830
          IF (DTNH) 36,36,2                                   P66 840
36        PRINT 37, N                                         P66 850
          STOP                                                P66 860
C                                                             P66 870
37        FORMAT (//,2X,15HDTNH=0 AT CYCLE,I5)                P66 880
38        FORMAT (//,2X,15HSMAX=0 AT CYCLE,I5)                P66 890
39        FORMAT (31H SENSE SWITCH 2 IS ON AT CYCLE I10)      P66 900
          END                                                 P66 910-
```

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```
      SUBROUTINE HYDRO                                          HYD   10
C                                                               HYD   20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YHYD   30
     1DZ(801),ZM(801),TSPALL(801),US(100)
C                                                               HYD   50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6HYD   60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)HYD   70
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80HYD   80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),YO(6)       HYD   90
C                                                               HYD  100
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,J5MAX,JSMAXI,JRZL,JSTAR,JTHYD  110
     1S,J2PUL,LINE,LOZHIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NHYD  120
     2TEDT,PDTNEG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE     HYD  130
C                                                               HYD  140
      DIMENSION XS(100), SM(100)
C
      SDURM=SSTOPM                                              HYD  150
      SK2M=0.                                                   HYD  160
      SMAX=0.                                                   HYD  170
      M=1                                                       HYD  180
      LL=1                                                      HYD  190
      MS=1
C        LEFT BOUNDARY CONDITIONS                               HYD  200
      U(1)=U(1)-DTN*(S(2)+Q(2))/ZM(2)                           HYD  210
      X(1)=X(1)+DTNH*U(1)                                       HYD  220
C          HYDRO ZONE LOOP                                      HYD  230
      DO 38 J=2,JFIN                                            HYD  240
      DOLD=D(J)                                                 HYD  250
      QOLD=Q(J)                                                 HYD  260
      POLD=P(J)                                                 HYD  270
C        CHANGE MATERIAL INDEX AND ADD NEW ACTIVE ZONE          HYD  280
      IF (J-JBND(M)) 2,1,2                                      HYD  290
1     LL=LL+1                                                   HYD  300
2     IF (J-1-JSTAR) 8,3,3                                      HYD  310
3     NWHAT=3                                                   HYD  320
      CALL SSCAL (NWHAT,EADD,J+1)                               HYD  330
      E(J+1)=EADD                                               HYD  340
      IF (E(J+1)) 5,4,5                                         HYD  350
4     P(J+1)=0.                                                 HYD  360
      GO TO 8                                                   HYD  370
5     IF (D(J+1)) 6,6,7                                         HYD  380
6     P(J+1)=0.                                                 HYD  390
      S(J+1)=0.                                                 HYD  400
      GO TO 8                                                   HYD  410
7     CALL EQST (E(J+1),D(J+1),P(J+1),LL)                       HYD  420
      S(J+1)=P(J+1)-SD(J+1)                                     HYD  430
C        CHECK FOR SPALLED ZONE
8     IF (TSPALL(J).EQ.1.234)GO TO 9
C        VELOCITY CALCULATION
      U(J)=U(J)-DTN*(S(J+1)+Q(J+1)-S(J)-Q(J))/(ZM(J)+ZM(J+1))
      IF (ABS(U(J)).LT.1.E-3)U(J)=0.0
      DU=U(J)-U(J-1)
C        COORDINATE CALCULATION
      X(J)=X(J)+DTNH*U(J)
C        DENSITY CALCULATION
      D(J)=ZM(J)/(X(J)-X(J-1))
      GO TO 10
C          SPALL PATH
C        VELOCITY CALCULATION
9     TSPALL=3
      U(J)=U(J)-DTN*(S(J+1)+Q(J+1))/ZM(J+1)
```

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```
          US(MS)=US(MS)+DTNH*(S(J)+Q(J))/ZM(J)
          IF (ABS(U(J)).LT.1.E-3)U(J)=0.0
          IF (ABS(US(MS)).LT.1.E-3)US(MS)=0.0
          DU=US(MS)-U(J-1)
C              COORDINATE CALCULATION
          X(J)=X(J)+DTNH*U(J)
          XS(MS)=XS(MS)+DTNH*US(MS)
C              DENSITY CALCULATION
          D(J)=ZM(J)/(XS(MS)-X(J-1))
C              CHECK FOR COMBINE
          IF (XS(MS).LT.X(J)) GO TO 10
          U(J)=(U(J)*ZM(J+1)+US(MS)*ZM(J))/(ZM(J+1)+ZM(J))
          X(J)=X(J)+(XS(MS)-X(J))*ZM(J+1)/(ZM(J)+ZM(J+1))
          DU=U(J)-U(J-1)
          D(J)=ZM(J)/(X(J)-X(J-1))
          ISM=ISM-1
          IF (MS-1.EQ.ISM) GO TO 140
          DO 130 II=MS,ISM
          XS(II)=XS(II+1)
130       US(II)=US(II+1)
140       TSPALL(J)=0.0
          ISPALL=1
          XS(ISM+1)=0.0
          US(ISM+1)=0.0
          PRINT 66, J,X(J),N,TIME
          LINE=LINE+2
          IF (LINE.LE.50) GO TO 10
          PRINT 69
          LINE=0
10        IF (D(J).LT.0.0) PRINT 68, J,MS,N,XS(MS),X(J),X(J-1)
          DAVG=(D(J)+DOLD)/2.                                          HYD 530
          DV=DTNH*DU/ZM(J)                                            HYD 540
          IF (DV+1.) 11,12,12                                         HYD 550
C              ARTIFICIAL VISCOSITY CALCULATION                        HYD 560
11        Q(J)=(DU*C0*C0-C1*CS(J))*DU*DAVG                            HYD 570
          IF (Q(J)-1.E5) 12,13,13                                     HYD 580
12        Q(J)=0.                                                     HYD 590
          DU=0.                                                       HYD 600
          CS(J)=0.                                                    HYD 610
C              ENERGY ADDITION FROM DEPOSITION                         HYD 620
13        IF (TIME-DTNH-SSTOP*N) 14,14,15                            HYD 630
14        NWHAT=1                                                     HYD 640
          CALL SSCAL (NWHAT,FADD,J)                                   HYD 650
          E(J)=E(J)+EADD                                              HYD 660
C              STRESS - STRAIN CALCULATION                             HYD 670
15        VELS=DV*DAVG                                                HYD 680
          SD(J)=SD(J)+4./3.*AMU(M)*VELS                               HYD 690
          VMC=3./2.*SD(J)*SD(J)                                       HYD 700
          EMU=D(J)/RHO(M)-1.                                          HYD 710
          IF (VMC-2./3.*YOZ(J)*YOZ(J)) 18,18,16                      HYD 720
16        YOZ(J)=YOZ(J)+YADD(M)*ABS(DV)*D(J)*DOLD/RHO(M)/(.2-YMU(M)) HYD 730
          IF (VMC-2./3.*YOZ(J)*YOZ(J)) 18,18,17                      HYD 740
17        SD(J)=SD(J)*YOZ(J)*SQRT(2./(3.*VMC))                       HYD 750
18        CONTINUE                                                   HYD 760
          IF (EMU) 19,21,21                                          HYD 770
19        IF (E(J)-EQST(M)) 21,21,20                                 HYD 780
20        SD(J)=0.                                                   HYD 790
21        DISTE=SD(J)*VELS/DAVG                                      HYD 800
          E(J)=E(J)+DISTE                                            HYD 810
C              P - E INTERPOLATION SCHEME                              HYD 820
          IF (P(J)) 22,23,22                                         HYD 830
22        CALL EQST (E(J),D(J),P2,M)                                 HYD 840
```

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        E1=E(J)-P(J)*DV                                           HYD 850
        CALL EOST (E1,D(J),P1,M)                                  HYD 860
        E(J)=E(J)-(P2+P(J)+Q(J)+QOLD)*DV/(2.-(P1-P2)/P(J))        HYD 870
23      CALL EOST (F(J),D(J),P(J),M)                              HYD 880
        S(J)=P(J)-SD(J)                                           HYD 890
C          CHECK FOR FRACTURE
        JS=J-1
        IF (S(J).GE.0..O.S(JS).GE.0.)GO TO 41
        IF (TSPALL(J).EQ.1.234.O.TSPALL(JS).EQ.0.0)GO TO 41
        IF (ISPALL.NE.0.0.TSPALL(JS).EQ.1.234)GO TO 41
        SJ=(S(J)*ZM(J)+S(JS)*ZM(JS))/(ZM(J)+ZM(JS))
        IF (TSPALL(JS)+SJ.GE.0.0)GO TO 41
        IF (MS.LE.99) GO TO 380
        PRINT 70
        STOP
380     ISM=ISM+1
        II=ISM
        PRINT 65,JS,X(JS),N,TIME,SJ,TSPALL(JS),ISM
        TSPALL(JS)=1.234
        IS=1
        LINE=LINE+3
        IF (LINE.LT.50) GO TO 40
        PRINT 69
        LINE=0
        GO TO 40
390     XS(II)=XS(II-1)
        US(II)=US(II-1)
        II=II-1
40      IF (II.GT.MS) GO TO 390
        XS(MS)=X(JS)
        US(MS)=U(JS)
        ISPALL=2
C          SMAX CALCULATION
41      IF (S(J)-SMAX) 25,25,24
24      SMAX=S(J)                                                 HYD 920
        JSMAX=J                                                   HYD 930
C          SOUND SPEED CALCULATION                               HYD 940
25      IF (DV) 27,26,26                                          HYD 950
26      DFUDG=1.001*D(J)                                          HYD 960
        GO TO 28                                                  HYD 970
27      DFUDG=.999*D(J)                                           HYD 980
28      CALL EOST (E(J),DFUDG,PFUDG,M)                            HYD 990
        DPDRHO=(PFUDG-P(J))/(DFUDG-D(J))                          HYD1000
        IF (DPDRHO) 29,29,30                                      HYD1010
29      CS(J)=0.                                                  HYD1020
        GO TO 31                                                  HYD1030
30      CS(J)=SQRT(DPDRHO)                                        HYD1040
31      SK2M1=(CS(J)*2.*C1*CS(J)-4.*C0*C0*DU)/(X(J)-X(J-1))       HYD1050
        IF (TSPALL(J).EQ.1.234) SK2M1=(CS(J)*2.*C1*CS(J)-4.*C0*C0*DU)/(XS(
       1MS)-X(J-1))
        IF (SK2M-SK2M1) 32,32,33                                  HYD1060
32      SK2M=SK2M1                                                HYD1070
        JTS=J                                                     HYD1080
33      M=LL                                                      HYD1090
        IF (ISPALL.GE.2) MS=MS+1
        ISPALL=0
C          END OF CYCLE CHECKS                                   HYD1100
        IF (U(J)) 38,34,38                                        HYD1110
34      IF (N-1) 35,35,36                                         HYD1120
35      JSMAX1=JSMAX+10                                           HYD1130
        IF (L07H17) 36,37,36                                      HYD1140
C          JSTAR CALCULATION                                     HYD1150
```

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36      IF (J-JSTAR) 38,38,37                                         HYD1160
37      JSTAR=J-1                                                     HYD1170
        GO TO 39                                                      HYD1180
38      CONTINUE                                                      HYD1190
        JSTAR=JFIN-1                                                  HYD1200
39      IF (IS.LE.0) RETURN
C           SPALL MOMENTUM CALCULATION
        IS=0
        I=0
        MS=1
        SMM=0
        DO 63 J=2,JFIN
        IF (TSPALL(J).EQ.1.234) GO TO 60
        SMM=SMM+ZM(J)*(U(J)+U(J-1))/2
        IF (J.EQ.JFIN) GO TO 62
        GO TO 63
60      SMM=SMM+ZM(J)*(US(MS)+U(J-1))/2
        MS=MS+1
62      I=I+1
        SM(I)=SMM
        SMM=0.0
63      CONTINUE
        PRINT 67, (SM(J),J=1,I)
        I=I/8
        LINE=LINE+I+3
        IF (LINE.LE.50) GO TO 64
        PRINT 69
        LINE=0
64      RETURN
C
C
65      FORMAT (/* === SPALL OCCURED AT ZONE*I4* LOCATION*E12.4* CM AT CY
     1CLE*I4* TIME=*E11.4* SEC   SJ =*E11.4* TSPALL(J)=*E11.4*/,9X*TOTAL
     2 NO OF FRACTURES IS*I3)
66      FORMAT (/* $$$ COMBINED ZONE*I4* LOCATION*E12.4* CM  AT CYCLE*I4*
     1 TIME=*E11.4* SEC*)
67      FORMAT (/* MOMENTUM AFTER FRACTURE*/(8E14.4))
68      FORMAT (* NEGATIVE DENSITY ZONE*I4* MS=*I3* CYCLE NO*I4*/,* XS
     1(MS)=*E14.4* X(J)=*E14.4* X(J-1)=*E14.4)
69      FORMAT (1H1)
70      FORMAT (/*   PROGRAM HAS REACHED THE NO OF SPALLS DIMENSIONED*)
        END                                                          HYD1220-
```

16

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      SUBROUTINE GENRAT                                          GEN   10
C                                                                GEN   20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YGEN   30
     10Z(801),ZM(801),TSPALL(801),US(100)
C                                                                GEN   50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6GEN   60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)GEN   70
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80GEN   80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),Y0(6)        GEN   90
C                                                                GEN  100
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTGEN  110
     1S,JZPUL,LINE,LOZHIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NGEN  120
     2TFDT,PDTNEG,PDTPOS,SDURM,SK2M,SHAX,SSTOPM,TIME,TS,WTAPE     GEN  130
C                                                                GEN  140
      DIMENSION MATL(6), NOE(6), NZ(20), RZ(20), T(10), TBL(109)  GEN  150
C                                                                GEN  160
      DIMENSION AA(6,20), AC(10,109,6), B(6,20), EDGE(6,20), EE(10), EI(GEN  170
     110,109)                                                    GEN  180
C
      DIMENSION MSPALL(6),RSPALL(6),TTSPAL(6)
C                                                                GEN  190
      EQUIVALENCE (CS,AA), (CS(121),AC), (CS(6661),B), (CS(6781),EDGE),  GEN  200
     1(CS(6901),EE), (CS(6911),EI)                               GEN  210
C                                                                GEN  220
C         READ ALL NON-ENERGY SOURCE DEPENDENT DATA              GEN  230
1     READ 67, (DISCPT(I),I=1,12)                                GEN  240
      READ 68, NSPEC,NTEDT,NJEDIT,LOZHIZ,NSPAL
      IF (NTEDT) 3,3,2                                           GEN  260
2     READ 69, (TEDIT(I),I=1,NTEDT)                              GEN  270
3     IF (NJEDIT) 5,5,4                                          GEN  280
4     READ 68, (JEDIT(I),I=1,NJEDIT)                             GEN  290
5     IF (NSPAL.GT.0)READ 680, (MSPALL(I),RSPALL(I),TTSPAL(I),I=1,NSPAL)
      READ 68, NRZC,NMTRLS,JRZL,JZPUL,NPRIN,NTAPE,NREZON,JCYCS
      READ 69, CKS,TS,ANGLE                                      GEN  310
      NMT=NMTRLS-1                                               GEN  320
      READ 68, (NOE(M),M=1,NMTRLS)                               GEN  330
      IF (NMT) 7,7,6                                             GEN  340
6     READ 68, (JBND(M),M=1,NMT)                                 GEN  350
7     READ 68, JFIN,(NZ(L),L=1,NRZC)                            GEN  360
      READ 69, DX,TIME,(RZ(M),M=1,NRZC)                          GEN  370
      DX=DX/RZ(1)                                                GEN  380
      DO 8 M=1,NMTRLS                                            GEN  390
      READ 67, MATL(M)                                           GEN  400
      READ 69, RHO(M),EQSTC(M),EQSTD(M),EQSTE(M),EQSTG(M),EQSTH(M),EQSTSGEN  410
     1(M),PMIN(M)                                                GEN  420
      READ 69, CUSP1(M),CUSPA(M),CUSPC(M),CUSPD(M),CUSPG(M),CUSPS(M)     GEN  430
      READ 69, Y0(M),AMU(M),YADD(M),YMU(M)                       GEN  440
      EQSTN(M)=EQSTC(M)/EQSTG(M)/(EQSTE(M)*RHO(M))               GEN  450
      NOED=NOE(M)                                                GEN  460
8     READ 69, (AA(M,I),B(M,I),EDGE(M,I),I=1,NOED)               GEN  470
C         CALCULATE ZONING                                       GEN  480
      LZ=1                                                       GEN  490
      DO 11 J=2,JFIN                                             GEN  500
      IF (J-NZ(LZ)) 10,10,9                                      GEN  510
9     LZ=LZ+1                                                    GEN  520
10    DX=DX*RZ(LZ)                                               GEN  530
11    X(J)=X(J-1)+DX                                             GEN  540
C         PRINT ALL NON-ENERGY SOURCE DEPENDENT DATA             GEN  550
      PRINT 86                                                   GEN  560
      PRINT 67, (DISCPT(K),K=1,12)                               GEN  570
      PRINT 71                                                   GEN  580
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          PRINT 73, NRZC,NMTRLS,JRZL,JZPUL,NPRIN,NTAPE,LOZHIZ,JFIN,JCYCS,NREGEN 590
         1ZON                                                            GEN 600
          PRINT 78, ANGLE,TIME,CKS,TS                                    GEN 610
          PRINT 74                                                       GEN 620
          PRINT 75, (HZ(I),NZ(I),I=1,NRZC)                               GEN 630
          IF (NJEDIT) 13,13,12                                           GEN 640
   12     PRINT 88, (JEDIT(I),I=1,NJEDIT)                                GEN 650
          WRITE (4) (DISCPT(I),I=1,12),NJEDIT                            GEN 660
   13     IF (NTEDT) 14,15,14                                            GEN 670
   14     PRINT 87, (TEDIT(I),I=1,NTEDT)                                 GEN 680
   15     JB1=1                                                          GEN 690
          DO 19 M=1,NMTRLS                                               GEN 700
          IF (JBND(M)) 17,16,17                                          GEN 710
   16     JB2=JFIN                                                       GEN 720
          GO TO 18                                                       GEN 730
   17     JB2=JBND(M)                                                    GEN 740
   18     THKNS=X(JB2)-X(JB1)                                            GEN 750
          PRINT 79, MATL(M),RHO(M),JB1,JB2,THKNS                         GEN 760
          JB1=JB2                                                        GEN 770
          PRINT 80, EQSTC(M),EQSTD(M),EQSTE(M),EQSTG(M),EQSTH(M),EQSTS(M),EQGGEN 780
         1STN(M),PMIN(M)                                                 GEN 790
          PRINT 81, CUSP1(M),CUSPA(M),CUSPC(M),CUSPD(M),CUSPG(M),CUSPS(M) GEN 800
          PRINT 82, Y0(M),AMU(M),YADD(M),YMU(M)                          GEN 810
          NOED=NOE(M)                                                    GEN 820
          PRINT 83, NOED,(AA(M,I),B(M,I),EDGE(M,I),I=1,NOED)             GEN 830
   19     CONTINUE                                                       GFN 840
          PRINT 86                                                       GEN 850
    C                                                                    GEN 860
    C                                                                    GEN 870
    C         MULTI-ENERGY SOURCE CALCULATIONS                           GEN 880
    C                                                                    GEN 890
    C                                                                    GEN 900
          ANGLE=COS(ANGLE/57.2957795)                                    GEN 910
          DO 49 NS=1,NSPEC                                               GEN 920
    C         READ ENERGY SOURCE DATA                                    GEN 930
          READ 68, NHNU,NBB                                              GEN 940
          READ 69, START(NS),SSTOP(NS),(T(KK),EE(KK),KK=1,NBB)           GEN 950
          SSTOPM=AMAX1(SSTOPM,SSTOP(NS))                                 GEN 960
    C                                                                    GEN 970
    C         CALCULATE ABSORPTION COEFFICIENTS                          GEN 980
    C                                                                    GEN 990
          IF (NHNU) 20,26,20                                             GEN1000
    C         FOR ARBITRARY SPECTRUM                                     GEN1010
   20     READ 70, (TBL(I),EI(1,I),I=1,NHNU)                             GEN1020
          DO 24 M=1,NMTRLS                                               GEN1030
          K=1                                                            GEN1040
          DO 24 I=1,NHNU                                                 GEN1050
   21     IF (EDGE(M,K)-TBL(I)) 22,23,23                                 GEN1060
   22     K=K+1                                                          GEN1070
          GO TO 21                                                       GEN1080
   23     AC(1,I,M)=-RHO(M)*AA(M,K)*(TBL(I)**B(M,K))/ANGLE               GEN1090
   24     CONTINUE                                                       GEN1100
          EITOT=0.                                                       GEN1110
          DO 25 II=1,NHNU                                                GEN1120
          EI(1,II)=EI(1,II)*ANGLE                                        GEN1130
   25     EITOT=EITOT+EI(1,II)                                           GEN1140
          GO TO 34                                                       GEN1150
    C         FOR BLACK BODY SPECTRUM                                    GEN1160
   26     READ 69, (TBL(I),I=1,109)                                      GEN1170
          EITOT=0.                                                       GEN1180
          DO 30 M=1,NMTRLS                                               GEN1190
          DO 30 L=1,NBB                                                  GEN1200
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         K=1                                                          GEN1210
         DO 30 I=1,109                                                GEN1220
27       IF (EDGE(M,K)-TBL(I)*T(L)) 28,29,29                          GEN1230
28       K=K+1                                                        GEN1240
         GO TO 27                                                     GEN1250
29       AC(L,I,M)=-RHO(M)*AA(M,K)*(TBL(I)*T(L))**B(M,K)/ANGLE        GEN1260
30       CONTINUE                                                     GEN1270
         DO 33 L=1,NBB                                                GEN1280
         EE(L)=EE(L)*ANGLE                                            GEN1290
         DO 33 I=1,109                                                GEN1300
         IF (I-99) 31,31,32                                           GEN1310
31       EI(L,I)=EF(L)*.01                                            GEN1320
         GO TO 33                                                     GEN1330
32       EI(L,I)=EF(L)*.001                                           GEN1340
33       CONTINUE                                                     GEN1350
C                                                                     GEN1360
C           CALCULATE ENERGY DEPOSITION                              GEN1370
C                                                                     GEN1380
34       M=1                                                          GEN1390
         DO 44 J=2,JFIN                                               GEN1400
         ESUM=0.                                                      GEN1410
         IF (J-1-JBND(M)) 36,35,36                                    GEN1420
35       M=M+1                                                        GEN1430
36       IF (NHNU) 37,40,37                                           GEN1440
C           FOR ARBITRARY SPECTRUM                                   GEN1450
37       DO 39 I=1,NHNU                                               GEN1460
         IF (EI(1,I)-1.E-20) 39,38,38                                 GEN1470
38       EIZ=EI(1,I)*(1.-EXP(AC(1,I,M)*(X(J)-X(J-1))))               GEN1480
         EI(1,I)=EI(1,I)-EIZ                                          GEN1490
         ESUM=ESUM+EIZ                                                GEN1500
39       CONTINUE                                                     GEN1510
         GO TO 43                                                     GEN1520
C           FOR BLACK BODY SPECTRUM                                  GEN1530
40       DO 42 L=1,NBB                                                GEN1540
         DO 42 I=1,109                                                GEN1550
         IF (EI(L,I)-1.E-20) 42,41,41                                 GEN1560
41       EIZ=EI(L,I)*(1.-EXP(AC(L,I,M)*(X(J)-X(J-1))))               GEN1570
         EI(L,I)=EI(L,I)-EIZ                                          GEN1580
         ESUM=ESUM+EIZ                                                GEN1590
42       CONTINUE                                                     GEN1600
43       SS(J,NS)=ESUM*4.186E7/RHO(M)/(X(J)-X(J-1))/(SSTOP(NS)-START(NS)) GEN1610
         IF (SS(J,NS)-1.E12/RHO(M)) 45,44,44                          GEN1620
44       CONTINUE                                                     GEN1630
C           ENERGY INPUT EDIT                                        GEN1640
45       IF (NHNU) 47,46,47                                           GEN1650
46       PRINT 72, (TBL(I),I=1,109)                                   GEN1660
         GO TO 48                                                     GEN1670
47       PRINT 72, (TBL(I),I=1,NHNU)                                  GEN1680
48       PRINT 90                                                     GEN1690
         PRINT 89, EITOT,NBR,START(NS),SSTOP(NS)                     GEN1700
         PRINT 76                                                     GEN1710
         PRINT 77, (T(I),EE(I),I=1,NBB)                               GEN1720
         PRINT 90                                                     GEN1730
49       CONTINUE                                                     GEN1740
C                                                                     GEN1750
C           CLEAR STORAGE FOR HYDRO                                  GEN1760
C                                                                     GEN1770
         DO 50 I=1,8010                                               GEN1780
50       CS(I)=0.                                                     GEN1790
C           INITIALIZE COUNTERS AND CONSTANTS                        GEN1800
         NBZ=50                                                       GEN1810
         CN=1.8                                                       GEN1820
```

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      C1=.25                                              GEN1830
      IT=1                                                GEN1840
      NTEDT=0                                             GEN1850
      LINE=0                                              GEN1860
      PDTPOS=0.                                           GEN1870
      PDTNEG=0.                                           GEN1880
      DTN=TIME                                            GEN1890
      DTNH=TIME                                           GEN1900
      IF (NJEDIT) 53,53,51                                GEN1910
51    DO 52 I=1,NJEDIT                                    GEN1920
52    JORG(I)=JEDIT(I)                                    GEN1930
53    CONTINUE                                            GEN1940
C         INITIALIZE ZONE VARIABLES                       GEN1950
      M=1                                                 GEN1960
      DO 55 J=2,JFIN                                      GEN1970
      YOZ(J)=YO(M)                                        GEN1980
      D(J)=RHO(M)                                         GEN1990
      ZM(J)=(X(J)-X(J-1))*D(J)                            GEN2000
      TSPALL(J)=-PMIN(M)
      IF (PMIN(M).EQ.0.0) TSPALL(J)=1.E+15
      IF (J-JBND(M)) 55,54,55                             GEN2010
54    M=M+1                                               GEN2020
55    CONTINUE                                            GEN2030
C
C         TSPALL(J) INPUT
C
      IF (NSPAL.LE.0) GO TO 910
      DO 900 I=1,NSPAL
      M=MSPALL(I)
      K2=JBND(M)
      IF (K2.EQ.0)K2=JFIN
      IF (M.GT.1) GO TO 850
      K=1
      GO TO 860
850   K=JBND(M-1)
860   THKS=X(K)+(X(K2)  =X(K))*RSPALL(I)
      IF (RSPALL(I).GT.0.) GO TO 870
      J=K+1
      GO TO 890
870   DO 880 J=K,JFIN
      IF (X(J).GE.THKS) GO TO 890
880   CONTINUE
890   MSPALL(I)=J
900   TSPALL(J)=-TTSPAL(I)
      PRINT 164, (I,MSPALL(I),TTSPAL(I),I=1,NSPALL)
910   CONTINUE
C
C         DEPOSITION EDIT                                 GEN2040
C                                                         GEN2050
      PRINT 84, (DISCPT(I),I=1,12)                        GEN2060
      M=1                                                 GEN2070
      SUMCAL=0.                                           GEN2080
      DO 44 J=2,JFIN                                      GEN2090
      EPG=0.                                              GEN2100
      DO 56 I=1,NSPEC                                     GEN2110
56    EPG=SS(J,I)*(SSTOP(I)-START(I))+EPG                 GEN2120
      IF (J-(JBND(M)+1)) 58,57,58                         GEN2130
57    M=M+1                                               GEN2140
58    IF (EPG*EQSTG(M)-1.E7) 59,59,61                     GEN2150
59    IF (JSTAR) 60,60,61                                 GEN2160
60    JSTAR=J                                             GEN2170
61    DX=X(J)-X(J-1)                                      GEN2180
                                                          GEN2190
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       ERGPA=EPG*RHO(M)*DX                                                    GEN2200
       CALPA=ERGPA*1.E-7/4.186                                                GEN2210
       SUMCAL=SUMCAL+CALPA                                                    GEN2220
       PRINT 85, J,DX,X(J),ERGPA,CALPA,SUMCAL,EPG,YOZ(J),ZM(J),J              GEN2230
       IF (MOD(J,50)) 64,62,64                                                GEN2240
62     IF (J-JFIN) 63,64,64                                                   GEN2250
63     PRINT 84, (DISCPT(I),I=1,12)                                           GEN2260
64     CONTINUE                                                               GEN2270
       IF (JSTAR) 65,65,66                                                    GEN2280
65     JSTAR=JFIN                                                             GEN2290
66     PRINT 86                                                              GEN2300
       RETURN                                                                 GEN2310
                                                                             GEN2320
C
67     FORMAT (12A6)                                                         GEN2330
68     FORMAT (8I10)                                                         GEN2340
69     FORMAT (8E10.3)                                                       GEN2350
70     FORMAT (2E15.7)                                                       GEN2360
71     FORMAT (46H ***** THIS PROBLEM WAS RUN WITH PUFF 66 *****,/)          GEN2370
72     FORMAT (13H TABLE VALUES/(10E10.3,/))                                 GEN2380
73     FORMAT (/,6X,4HNRZC,4X,6HNMTRLS,6X,4HJRZL,5X,5HJZPUL,5X,5HNPRIN5X,    GEN2390
      15HNTAPE,4X,6HLOZHIZ,6X,4HJFIN,5X,5HJCYCS,4X,6HNREZON,/,10I10)         GEN2400
74     FORMAT (/12H ZONING USED/)                                            GEN2410
75     FORMAT (3X,6H RATIOE10.3,8H TO ZONEI4)                                GEN2420
76     FORMAT (/17H BLACK BODY INPUT/)                                       GEN2430
77     FORMAT (12H TEMPERATURE5X,7H ENERGY/,10(2E12.3,/))                    GEN2440
78     FORMAT (/,5X,5HANGLE,6X,4HTIME,7X,3HCKS,8X,2HTS,/4E10.3)              GEN2450
79     FORMAT (25HOMATERIAL PROPERTIES FOR A8,5X,4HRHO=E10.3,5X,7HFROM J=GEN2460
      1I4,1X,5HTO J=I4,5X,11HTHICKNESS =E10.3)                               GEN2470
80     FORMAT (/,10X,5HEQSTC10X,5HEQSTD10X,5HEQSTE10X,5HEQSTG10X,5HEQSTM1GEN2480
      10X,5HEQSTS10X,5HEQSTN11X,4HPMIN/8E15.5)                               GEN2490
81     FORMAT (/,10X,5HCUSP110X,5HCUSPA10X,5HCUSPC10X,5HCUSPD10X,5HCUSPG1GEN2500
      10X,5HCUSPS/8E15.5)                                                    GEN2510
82     FORMAT (/,13X,2HY0,12X,3HAMU,11X,4HYADD,12X,3HYMU,/,4E15.5)           GEN2520
83     FORMAT (//,6H NOE =I3,19X,2HAA14X,1HB11X,4HEDGE/,20(15X,3E15.5/))     GEN2530
84     FORMAT (1H1,12A6,/5H0   J 6X,2HDX13X,1HX11X,4HERGS10X,3HCAL10X,7HSUBGEN2540
      1M CAL7X,7HERGS/GM9X,3HYOZ,8X,9HZONE MASS4X,1HJ//)                     GEN2550
85     FORMAT (1H I3,8E14.5,I4)                                              GEN2560
86     FORMAT (1H1)                                                          GEN2570
87     FORMAT (/15H THE TEDITS ARE/(10E10.3/))                               GEN2580
88     FORMAT (/15H THE JEDITS ARE/10I10/)                                   GEN2590
89     FORMAT (5X,5HEITOT,7X,3HNBB,5X,5HSTART,5X,5HSSTOP,/,E10.3,I10,2E10GEN2600
      1.3)                                                                   GEN2610
90     FORMAT (//)                                                           GEN2620
6A0    FORMAT (I10,2E10.3)
164    FORMAT (* SPALL STRENGTH OF INDIVIDUAL ZONES*//(5(I4*,  TSPALL(*I3
      1*)=*E10.3)))
       END                                                                   GEN2630=
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      SUBROUTINE REZONE                                              REZ  10
C                                                                    REZ  20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YREZ  30
     107(801),ZM(801),TSPALL(801),US(100)                            REZ  40
C                                                                    REZ  50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6REZ  60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)REZ  70
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80REZ  80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),Y0(6)            REZ  90
C                                                                    REZ 100
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTREZ 110
     1S,JZPUL,LINE,LOZHIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NREZ 120
     2TEDT,PDTNFG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE         REZ 130
C                                                                    REZ 140
      DIMENSION SSL(5), SSR(5)                                        REZ 150
C                                                                    REZ 160
C        REZONE AHEAD OF MAX STRESS                                  REZ 170
C                                                                    REZ 180
C        DETERMINATION OF PULSE TO BE USED IN DIVIDE ROUTINE         REZ 190
      SSMAX=SMAX                                                      REZ 200
      SJSMAX=JSMAX                                                    REZ 210
      IF (X(JSMAX)-XOSM) 1,7,7                                        REZ 220
1     DO 2 J=JSMAX,JSTAR                                             REZ 230
      IF (S(J)-.5*SMAX) 3,2,2                                        REZ 240
2     CONTINUE                                                        REZ 250
      GO TO 7                                                         REZ 260
3     RSMAX=0.                                                        REZ 270
      DO 5 JJ=J,JSTAR                                                 REZ 280
      IF (RSMAX-S(JJ)) 4,4,5                                          REZ 290
4     RSMAX=S(JJ)                                                     REZ 300
      JRSMAX=JJ                                                       REZ 310
5     CONTINUE                                                        REZ 320
      IF (RSMAX-.5*SMAX) 7,6,6                                        REZ 330
6     SMAX=RSMAX                                                      REZ 340
      JSMAX=JRSMAX                                                    REZ 350
7     XOSM=X(JSMAX)                                                   REZ 360
C        MOMENTUM CALCULATION                                        REZ 370
      JSMAXI=0                                                        REZ 380
      NZDIVD=0                                                        REZ 390
      NZCOMB=0                                                        REZ 400
      EMVPP=0.                                                        REZ 410
      J=JSMAX                                                         REZ 420
8     J=J-1                                                           REZ 430
      IF (U(J)) 10,9,9                                                REZ 440
9     EMVPP=EMVPP+U(J)*.5*(ZM(J+1)+ZM(J))                            REZ 450
      IF (J-1) 10,10,8                                                REZ 460
10    J=JSMAX-1                                                       REZ 470
11    J=J+1                                                           REZ 480
      IF (U(J)) 13,13,12                                              REZ 490
12    EMVPP=EMVPP+U(J)*.5*(ZM(J+1)+ZM(J))                            REZ 500
      IF (J-JSTAR) 11,11,13                                           REZ 510
13    DTPP=EMVPP/SMAX                                                 REZ 520
      IF (DTPP) 14,14,15                                              REZ 530
14    SMAX=SSMAX                                                      REZ 540
      JSMAX=SJSMAX                                                    REZ 550
      GO TO 120                                                       REZ 560
15    CONTINUE                                                        REZ 570
C        CALCULATE OPTIMUM ZONE SIZE FOR DIVIDE                      REZ 580
      RZDX=2.*DTPP*CS(JSMAX)/FLOAT(JZPUL)                            REZ 590
      J=JSMAX                                                         REZ 600
C        DIVIDE ENTRY CHECKS                                         REZ 610
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        IF (JSMAX+50-JAHEAD) 16,17,17                               REZ 620
16      JDIV=50                                                      REZ 630
        GO TO 18                                                     REZ 640
17      JDIV=75                                                      REZ 650
        JAHEAD=JSMAX+75                                              REZ 660
18      J=J+1                                                        REZ 670
        IF (J+1-JFIN) 19,58,58                                       REZ 680
19      IF (X(J)-X(J-1)-RZDX) 20,20,21                               REZ 690
20      IF (J-JSMAX-JDIV) 18,58,58                                   REZ 700
21      JFINO=JFIN                                                   REZ 710
        JBNDCK=0                                                     REZ 720
        DO 23 M=1,NMTRLS                                             REZ 730
        IF (J-1-JBND(M)) 24,22,23                                    REZ 740
22      JBNDCK=M                                                     REZ 750
23      CONTINUE                                                     REZ 760
        M=NMTRLS                                                     REZ 770
C          DIVIDE LOOP                                               REZ 780
24      IF (JBNDCK) 25,25,27                                         REZ 790
25      RZR=(.5*(X(J-1)+X(J))-X(J-2))/(X(J)-X(J-2))                  REZ 800
        EL=E(J-1)+RZR*(E(J)-E(J-1))                                  REZ 810
        SDL=SD(J-1)+RZR*(SD(J)-SD(J-1))                             REZ 820
        YOZL=YOZ(J-1)+RZR*(YOZ(J)-YOZ(J-1))                         REZ 830
        DL=D(J-1)+RZR*(D(J)-D(J-1))                                 REZ 840
        DO 26 I=1,NSPEC                                              REZ 850
26      SSL(I)=SS(J-1,I)+RZR*(SS(J,I)-SS(J-1,I))                     REZ 860
        IF (J-JBND(M)) 27,29,27                                      REZ 870
27      RZR=(X(J+1)-.5*(X(J)+X(J-1)))/(X(J+1)-X(J-1))               REZ 880
        ER=E(J+1)+RZR*(E(J)-E(J+1))                                  REZ 890
        SDR=SD(J+1)+RZR*(SD(J)-SD(J+1))                             REZ 900
        YOZR=YOZ(J+1)+RZR*(YOZ(J)-YOZ(J+1))                         REZ 910
        DR=D(J+1)+RZR*(D(J)-D(J+1))                                 REZ 920
        DO 28 I=1,NSPEC                                              REZ 930
28      SSR(I)=SS(J+1,I)+RZR*(SS(J,I)-SS(J+1,I))                     REZ 940
        IF (JBNDCK) 33,33,31                                         REZ 950
29      RZR=(.5*(X(J)-X(J-1)))/(X(J)-X(J-2))                         REZ 960
        ER=E(J)+RZR*(E(J)-E(J-1))                                    REZ 970
        SDR=SD(J)+RZR*(SD(J)-SD(J-1))                               REZ 980
        YOZR=YOZ(J)+RZR*(YOZ(J)-YOZ(J-1))                           REZ 990
        DR=D(J)+RZR*(D(J)-D(J-1))                                   REZ1000
        DO 30 I=1,NSPEC                                              REZ1010
30      SSR(I)=SS(J,I)+RZR*(SS(J,I)-SS(J-1,I))                       REZ1020
        GO TO 33                                                     REZ1030
31      RZR=(.5*(X(J)-X(J-1)))/(X(J+1)-X(J-1))                       REZ1040
        EL=E(J)+RZR*(E(J)-E(J+1))                                    REZ1050
        SDL=SD(J)+RZR*(SD(J)-SD(J+1))                               REZ1060
        YOZL=YOZ(J)+RZR*(YOZ(J)-YOZ(J+1))                           REZ1070
        DL=D(J)+RZR*(D(J)-D(J+1))                                   REZ1080
        DO 32 I=1,NSPEC                                              REZ1090
32      SSL(I)=SS(J,I)+RZR*(SS(J+1,I)-SS(J,I))                       REZ1100
33      XR=X(J)                                                      REZ1110
        XL=.5*(X(J)+X(J-1))                                          REZ1120
        ZMR=(XR-XL)*DR                                               REZ1130
        ZML=(XR-XL)*DL                                               REZ1140
        UR=U(J)                                                      REZ1150
        UL=((ZM(J)-ZML)*U(J-1)+(ZM(J)-ZMR)*U(J))/(ZML+ZMR)         REZ1160
        CALL EQST (EL,DL,PL,M)                                      REZ1170
        CALL EQST (ER,DR,PR,M)                                      REZ1180
        SL=PL-SDL                                                    REZ1190
        SR=PR-SDR                                                    REZ1200
        QL=Q(J)                                                      REZ1210
        QR=Q(J)                                                      REZ1220
        CSL=CS(J)                                                    REZ1230
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        CSR=CS(J)                                                        REZ1240
        NMT=NMTRLS-1                                                     REZ1250
        IF (NMT-M) 36,34,34                                             REZ1260
34      DO 35 MI=M,NMT                                                  REZ1270
35      JRND(MI)=JRND(MI)+1                                             REZ1280
36      JCK=J                                                          REZ1290
        J=JFIN                                                          REZ1300
37      X(J+1)=X(J)                                                     REZ1310
        U(J+1)=U(J)                                                     REZ1320
        ZM(J+1)=ZM(J)                                                   REZ1330
        D(J+1)=D(J)                                                     REZ1340
        S(J+1)=S(J)                                                     REZ1350
        E(J+1)=E(J)                                                     REZ1360
        SD(J+1)=SD(J)                                                   REZ1370
        YOZ(J+1)=YOZ(J)                                                 REZ1380
        P(J+1)=P(J)                                                     REZ1390
        Q(J+1)=Q(J)                                                     REZ1400
        CS(J+1)=CS(J)                                                   REZ1410
        TSPALL(J+1)=TSPALL(J)
        DO 38 I=1,NSPEC                                                 REZ1420
38      SS(J+1,I)=SS(J,I)                                               REZ1430
        J=J-1                                                          REZ1440
        IF (J-JCK) 39,39,37                                            REZ1450
39      X(J+1)=XR                                                       REZ1460
        X(J)=XL                                                         REZ1470
        U(J+1)=UR                                                       REZ1480
        U(J)=UL                                                         REZ1490
        ZM(J+1)=ZMR                                                     REZ1500
        ZM(J)=ZML                                                       REZ1510
        D(J+1)=DR                                                       REZ1520
        D(J)=DL                                                         REZ1530
        S(J+1)=SR                                                       REZ1540
        S(J)=SL                                                         REZ1550
        E(J+1)=ER                                                       REZ1560
        E(J)=EL                                                         REZ1570
        SD(J+1)=SDR                                                     REZ1580
        SD(J)=SDL                                                       REZ1590
        YOZ(J+1)=YOZR                                                   REZ1600
        YOZ(J)=YOZL                                                     REZ1610
        P(J+1)=PR                                                       REZ1620
        P(J)=PL                                                         REZ1630
        Q(J+1)=QR                                                       REZ1640
        Q(J)=QL                                                         REZ1650
        CS(J+1)=CSR                                                     REZ1660
        CS(J)=CSL                                                       REZ1670
        TSPALL(J+1)=TSPALL(J)
        IF (TSPALL(J-1).GT.TSPALL(J).A.TSPALL(J-1).NE.1.234) TSPALL(J)=TSP
     1ALL(J-1)
        DO 40 I=1,NSPEC                                                 REZ1680
        SS(J+1,I)=SSR(I)                                               REZ1690
40      SS(J,I)=SSL(I)                                                  REZ1700
        IF (NJEDIT) 44,44,41                                           REZ1710
41      DO 43 II=1,NJEDIT                                              REZ1720
        IF (J-JEDIT(II)) 42,42,43                                      REZ1730
42      JEDIT(II)=JEDIT(II)+1                                          REZ1740
43      CONTINUE                                                       REZ1750
44      IF (J-JSTAR) 45,45,46                                          REZ1760
45      JSTAR=JSTAR+1                                                   REZ1770
46      JFIN=JFIN+1                                                     REZ1780
        JAHEAD=JAHEAD+1                                                 REZ1790
C       DIVIDE LOOP EXIT CHECKS                                         REZ1800
        IF (JFIN-799) 47,57,57                                          REZ1810
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47      IF (X(J)-X(J-1)-RZDX) 48,24,24                                    REZ1820
48      IF (J-JSMAX-JDIV) 51,49,49                                        REZ1830
49      IF (JDIV-75) 57,50,50                                            REZ1840
50      JAHFAD=JSMAX+JDIV                                                REZ1850
        GO TO 57                                                         REZ1860
51      J=J+2                                                           REZ1870
        IF (J-JFIN) 52,57,57                                            REZ1880
52      IF (E(J+1)) 53,53,54                                            REZ1890
53      NWHAT=2                                                          REZ1900
        CALL SSCAL (NWHAT,EADD,J+1)                                     REZ1910
        E(J+1)=EADD                                                     REZ1920
54      IF (J-1-JBND(M)) 55,56,55                                       REZ1930
55      JBNDCK=0                                                        REZ1940
        GO TO 25                                                        REZ1950
56      M=M+1                                                           REZ1960
        JBNDCK=1                                                        REZ1970
        GO TO 27                                                        REZ1980
C           END DIVIDE                                                  REZ1990
57      NZDIVD=IABS(JFINO-JFIN)                                         REZ2000
C                                                                       REZ2010
C           REZONE BEHIND MAX STRESS                                    REZ2020
C                                                                       REZ2030
58      SMAX=SSMAX                                                      REZ2040
        JSMAX=SJSMAX                                                    REZ2050
        IF (JRZL) 116,116,59                                            REZ2060
59      IF (LOZHIZ) 60,61,60                                            REZ2070
60      IF (N-NRZ-100) 116,62,62                                        REZ2080
61      IF (N-NRZ-25) 116,62,62                                         REZ2090
C           DETERMINE FIRST ZONE WITH ENERGY LESS THAN SUBLIMATION ENERGY  REZ2100
62      M=1                                                             REZ2110
        DO 65 J=2,JSTAR                                                 REZ2120
        IF (J-1-JBND(M)) 64,63,64                                       REZ2130
63      M=M+1                                                           REZ2140
64      IF (E(J)-EQSTE(M)) 66,65,65                                     REZ2150
65      CONTINUE                                                        REZ2160
        JV=JSTAR                                                        REZ2170
        GO TO 67                                                        REZ2180
66      JV=J-1                                                          REZ2190
67      JFINO=JFIN                                                      REZ2200
        J=JSMAX                                                         REZ2210
C           DETERMINE LAST ZONE TO THE LEFT OF JSMAX WITH S EQUAL TO OR  REZ2220
C           GREATER THAN .2*SMAX                                        REZ2230
68      J=J-1                                                           REZ2240
        IF (S(J)/SMAX-.2) 69,68,68                                      REZ2250
69      JPLC=J+1                                                        REZ2260
C           COMBINE ENTRY CHECKS                                       REZ2270
        IF (JPLC-JV-JRZL) 70,70,76                                      REZ2280
70      IF (JSMAX-JPLC-JZPUL) 115,115,71                                REZ2290
C           COMBINE FROM JPLC TO .8*SMAX                               REZ2300
71      J=JPLC                                                          REZ2310
        DO 72 M=1,NMTRLS                                               REZ2320
        IF (J-JBND(M)) 73,72,72                                         REZ2330
72      CONTINUE                                                        REZ2340
        M=NMTRLS                                                        REZ2350
73      CONTINUE                                                        REZ2360
        DO 74 MM=1,NMTRLS                                              REZ2370
        IF (JSMAX-JBND(MM)) 75,75,74                                    REZ2380
74      CONTINUE                                                        REZ2390
        MM=NMTRLS                                                       REZ2400
75      RZR=RZDX*.5/D(JSMAX)*RHO(MM)                                   REZ2410
        NREG=3                                                          REZ2420
        GO TO 80                                                        REZ2430
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C         COMBINE FROM JV TO JPLC                                      REZ2440
76        NREG=1                                                       REZ2450
77        DO 78 M=1,NMTRLS                                             REZ2460
          IF (JV+1-JBND(M)) 79,79,78                                   REZ2470
78        CONTINUE                                                     REZ2480
          M=NMTRLS                                                     REZ2490
79        CONTINUE                                                     REZ2500
          RZR=(X(JPLC)-X(JV))/FLOAT(JRZL)                              REZ2510
          J=JV                                                         REZ2520
C         COMBINE LOOP                                                 REZ2530
80        IF (TSPALL(J+1).EQ.1.234) GO TO 104
          IF (J.LT.7) GO TO 800
          IF (TSPALL(J).EQ.1.234) GO TO 104
          IF (TSPALL(J+2).EQ.1.234.O.TSPALL(J+3).EQ.1.234) GO TO 104
800       IF (X(J+1)-X(J)-RZR) 81,104,104                             REZ2550
81        IF (J+1-JBND(M)) 82,104,82                                   REZ2550
82        IF (NJEDIT) 85,85,83                                         REZ2560
83        DO 84 II=1,NJEDIT                                            REZ2570
          IF (J+1-JEDIT(II)) 84,104,84                                 REZ2580
84        CONTINUE                                                     REZ2590
85        ZMINV=1./(ZM(J+1)+ZM(J+2))                                  REZ2600
          DO 86 I=1,NSPEC                                              REZ2610
86        SS(J+1,I)=(SS(J+1,I)*ZM(J+1)+SS(J+2,I)*ZM(J+2))*ZMINV       REZ2620
          UR=((U(J+2)+U(J+3))/2.*ZM(J+3)+(U(J+1)+U(J+2))/2.*ZM(J+2))/(ZM(J+2REZ2630
      1)+ZM(J+3))                                                      REZ2640
          UL=(U(J)*(ZM(J)+ZM(J+1))+U(J+1)*(ZM(J+1)+ZM(J+2))+U(J+2)*(ZM(J+2)+REZ2650
      1ZM(J+3))-UR*(ZM(J+1)+ZM(J+2)+ZM(J+3)))/(ZM(J)+ZM(J+1)+ZM(J+2))  REZ2660
          E(J)=E(J)+(U(J-1)+U(J))*(U(J-1)+U(J))/8.-(U(J-1)+UL)*(U(J-1)+UL)/8.REZ2670
      1.                                                               REZ2680
          E(J+1)=(E(J+1)*ZM(J+1)+E(J+2)*ZM(J+2)+((U(J)+U(J+1))*(U(J)+U(J+1))REZ2690
      1*ZM(J+1)+(U(J+1)+U(J+2))*(U(J+1)+U(J+2))*ZM(J+2))/8.)/(ZM(J+1)+ZM(REZ2700
      2J+2))-(UL+UR)*(UL+UR)/8.                                        REZ2710
          EJ2=E(J+3)+(U(J+2)+U(J+3))*(U(J+2)+U(J+3))/8.-(UR+U(J+3))*(UR+U(J+REZ2720
      13))/8.                                                          REZ2730
          U(J)=UL                                                      REZ2740
          U(J+1)=UR                                                    REZ2750
          SD(J+1)=(SD(J+1)*ZM(J+1)+SD(J+2)*ZM(J+2))*ZMINV             REZ2760
          VOZ(J+1)=(VOZ(J+1)*ZM(J+1)+VOZ(J+2)*ZM(J+2))*ZMINV         REZ2770
          ZM(J+1)=ZM(J+1)+ZM(J+2)                                      REZ2780
          Q(J+1)=(Q(J+1)+Q(J+2))/2.0                                   REZ2790
          CS(J+1)=(CS(J+1)+CS(J+2))/2.0                                REZ2800
          X(J+1)=X(J+2)                                                REZ2810
          D(J+1)=ZM(J+1)/(X(J+1)-X(J))                                 REZ2820
          IF (TSPALL(J+2).LT.TSPALL(J+1).O.TSPALL(J+2).EQ.1.234) TSPALL(J+1)
      1=TSPALL(J+2)
          IF (M-1) 89,89,87                                            REZ2830
87        IF (J-JBND(M-1)) 89,88,89                                    REZ2840
88        CALL EOST (E(J),D(J),P(J),M-1)                               REZ2850
          GO TO 90                                                     REZ2860
89        CALL EOST (E(J),D(J),P(J),M)                                 REZ2870
90        CALL EOST (E(J+1),D(J+1),P(J+1),M)                           REZ2880
          IF (J+2-JBND(M)) 92,91,92                                    REZ2890
91        CALL EOST (EJ2,D(J+3),PJ2,M+1)                               REZ2900
          GO TO 93                                                     REZ2910
92        CALL EOST (EJ2,D(J+3),PJ2,M)                                 REZ2920
93        S(J)=P(J)-SD(J)                                              REZ2930
          S(J+1)=P(J+1)-SD(J+1)                                        REZ2940
          JX=J+2                                                       REZ2950
          DO 95 JI=JX,JFIN                                             REZ2960
          X(JI)=X(JI+1)                                                REZ2970
          U(JI)=U(JI+1)                                                REZ2980
          ZM(JI)=ZM(JI+1)                                              REZ2990
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         D(JI)=D(JI+1)                                                  REZ3000
         S(JI)=S(JI+1)                                                  REZ3010
         E(JI)=E(JI+1)                                                  REZ3020
         SD(JI)=SD(JI+1)                                                REZ3030
         YOZ(JI)=YOZ(JI+1)                                              REZ3040
         P(JI)=P(JI+1)                                                  REZ3050
         Q(JI)=Q(JI+1)                                                  REZ3060
         CS(JI)=CS(JI+1)                                                REZ3070
         TSPALL(JI)=TSPALL(JI+1)
         DO 94 I=1,NSPEC                                                REZ3080
94       SS(JI,I)=SS(JI+1,I)                                            REZ3090
95       CONTINUE                                                       REZ3100
         E(J+2)=EJ2                                                     REZ3110
         P(J+2)=PJ2                                                     REZ3120
         S(J+2)=P(J+2)-SD(J+2)                                          REZ3130
         IF (NJEDIT) 99,99,96                                           REZ3140
96       DO 98 II=1,NJEDIT                                             REZ3150
         IF (J-JEDIT(II)) 97,98,98                                      REZ3160
97       JEDIT(II)=JEDIT(II)-1                                          REZ3170
98       CONTINUE                                                       REZ3180
99       JSMAX=JSMAX-1                                                  REZ3190
         JSTAR=JSTAR-1                                                  REZ3200
         JAHEAD=JAHEAD-1                                                REZ3210
         JFIN=JFIN-1                                                    REZ3220
         IF (J+1-JPLC) 100,101,101                                     REZ3230
100      JPLC=JPLC-1                                                    REZ3240
101      DO 103 MM=1,NMTRLS                                           REZ3250
         IF (J-JBND(MM)) 102,103,103                                    REZ3260
102      JBND(MM)=JBND(MM)-1                                            REZ3270
103      CONTINUE                                                       REZ3280
C           COMBINE LOOP EXIT CHECKS                                    REZ3290
104      GO TO (105,106,107), NREG                                      REZ3300
105      IF (S(J+1)-.2*SMAX) 106,110,110                               REZ3310
106      IF (J+1-JPLC) 108,70,70                                        REZ3320
107      IF (S(J+1)-.8*SMAX) 108,115,115                               REZ3330
108      J=J+1                                                          REZ3340
         IF (J-JBND(M)) 80,109,80                                       REZ3350
109      M=M+1                                                          REZ3360
         GO TO 80                                                       REZ3370
110      IF (J+1-JPLC) 111,70,70                                        REZ3380
111      J=JPLC-2                                                       REZ3390
112      IF (S(J)-.2*SMAX) 113,114,114                                 REZ3400
113      J=J-1                                                          REZ3410
         IF(J-JV) 70,70,112                                             REZ3420
114      JV=J                                                           REZ3430
         NREG=2                                                         REZ3440
         GO TO 77                                                       REZ3450
C           END COMBINE                                                 REZ3460
115      NZCOMB=IABS(JFINO-JFIN)                                       REZ3470
         NDZ=N                                                          REZ3480
116      IF (NZDIVD+NZCOMB) 120,120,117                                REZ3490
117      IF (LINE-55) 119,118,118                                       REZ3500
118      PRINT 122                                                      REZ3510
         LINE=0                                                         REZ3520
119      LINE=LINE+2                                                    REZ3530
         PRINT 121, N,NZDIVD,NZCOMB,JSTAR                              REZ3540
120      RETURN                                                         REZ3550
C                                                                       REZ3560
121      FORMAT (/,7X,15HREZONE AT CYCLE,I5,2X,5HADDED,I3,6H ZONES,2X,7HDELPREZ3570
        1ETED,I3,6H ZONES,2X,12HNEW JSTAR IS,I4)                        REZ3580
122      FORMAT (1H1)                                                   REZ3590
         END                                                           REZ3600-
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      SUBROUTINE EDIT                                                 EDT   1G
C                                                                     EDT   20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YEDT   30
     10Z(801),ZM(801),TSPALL(801),US(100)
C                                                                     EDT   50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6EDT   60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)EDT   70
     2,FQSTS(6),JBND(6),JEDIT(10),JORB(10),PHIN(6),RHO(6),SSTOP(5),SS(80EDT   80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),YQ(6)              EDT   90
C                                                                     EDT  100
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTEDT  110
     1S,JZPUL,LINE,LOZHIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NEDT  120
     2TEDT,PDTNEG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE          EDT  130
C                                                                     EDT  140
C         TAPE STORAGE FOR FUTURE EDIT                                EDT  150
      JSTARD=JSTAR+1                                                  EDT  160
      IF (WTAPE) 1,2,1                                                EDT  170
    1 WRITE (6) N,TIME,(DISCPT(I),I=1,12),JSTAR,JFIN,JSMAX,JSTARD,(JBND(
     1II),II=1,6)
      WRITE (6) (J,X(J),TSPALL(J),P(J),Q(J),E(J),D(J),SD(J),S(J),CS(J),J
     1=1,JSTARD)
C         TOTAL MOMENTUM CALCULATION                                 EDT  210
    2 EMVNEG=0.                                                       EDT  220
      EMVPOS=0.                                                       EDT  230
      ESUM=0.                                                         EDT  240
      EKSUM=0.                                                        EDT  250
      QMAX=0.                                                         EDT  260
      MS=1
      DO 8 J=2,JSTARD                                                 EDT  270
      IF (Q(J)-QMAX) 4,4,3                                            EDT  280
    3 QMAX=Q(J)                                                       EDT  290
      JQMAX=J                                                         EDT  300
    4 IF (TSPALL(J).NE.1.234)GO TO 60
      EMV=ZM(J)*(US(MS)+U(J-1))/2.
      MS=MS+1
      GO TO 61
   60 EMV=ZM(J)*(U(J)+U(J-1))/2.
   61 IF (EMV) 5,6,6
    5 EMVNEG=EMVNEG+EMV                                               EDT  330
      GO TO 7                                                         EDT  340
    6 EMVPOS=EMVPOS+EMV                                               EDT  350
    7 CONTINUE                                                        EDT  360
C         TOTAL ENERGY CALCULATION (IN CALORIES)                     EDT  370
      ESUM=ESUM+E(J)*ZM(J)/4.186E7                                   EDT  380
      EKSUM=EKSUM+ZM(J)*(U(J)+U(J-1))*(U(J)+U(J-1))/4.186E7/8.        EDT  390
    8 CONTINUE                                                        EDT  400
      ETOTAL=ESUM+EKSUM                                              EDT  410
      JM=JSMAX+3                                                      EDT  420
C         CALCULATE MOMENTUM OF MAIN PULSE                           EDT  430
      EMVPL=0.                                                        EDT  440
    9 EMVPL=EMVPL+U(JM)*.5*(ZM(JM+1)+ZM(JM))                          EDT  450
      IF (JM-JSMAX) 10,11,11                                          EDT  460
   10 IF (U(JM-1)) 13,13,11                                           EDT  470
   11 IF (JM-1) 13,13,12                                              EDT  480
   12 JM=JM-1                                                         EDT  490
      GO TO 9                                                         EDT  500
   13 JM=JSMAX+4                                                      EDT  510
C         CALCULATE MOMENTUM OF PRECURSOR                            EDT  520
      EMVPR=0.                                                        EDT  530
   14 EMVPR=EMVPR+U(JM)/2.*(ZM(JM)+ZM(JM+1))                          EDT  540
      IF (JM-JSTAR) 15,15,16                                          EDT  550
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15        JM= IM+1                                                    EDT 560
          GO TO 14                                                    EDT 570
16        EMVPP=EMVPL+FMVPR                                           EDT 580
          DTPP=EMVPP/SMAX                                             EDT 590
          DTPULS=EMVPL/SMAX                                           EDT 600
C            CALCULATE MAXIMUM POTENTIAL MOMENTUM OF VAPOR            EDT 610
          M=1                                                         EDT 620
          EMVRM=0.                                                    EDT 630
          DO 20 J=2,JSTAR                                             EDT 640
          IF (J-JBND(M)) 18,18,17                                     EDT 650
17        M=M+1                                                       EDT 660
18        DE=E(J)-EOSTE(M)                                            EDT 670
          IF (DE) 21,21,19                                            EDT 680
19        UAVG=(SQRT(U(J-1)*U(J-1)+2.*DE)+SQRT(U(J)*U(J)+2.*DE))/2.   EDT 690
20        EMVRM=EMVPM+UAVG*ZM(J)                                      EDT 700
21        CONTINUE                                                    EDT 710
C            PRINT OUTPUT VARIABLES                                   EDT 720
          JBND1=JBND(1)                                               EDT 730
          JBND2=JBND(2)                                               EDT 740
          JBND3=JBND(3)                                               EDT 750
          IF (LINE-50) 23,22,22                                       EDT 760
22        PRINT 25                                                    EDT 770
          LINE=0                                                      EDT 780
23        LINE=LINE+7                                                 EDT 790
          PRINT 24, N,TIME,DTNM,JTS,ETOTAL,JFIN,JSTAR,JSMAX,SMAX,X(JSMAX),DTEDT 800
         1PP,DTPULS,EMVNEG,EMVPOS,EMVPL,EMVPR,EMVPP,EMVBM,PDTPOS,PDTNEG,X(1)EDT 810
         2,X(JBND1),X(JBND2),X(JBND3),X(JFIN),JQMAX,QMAX,X(JQMAX)     EDT 820
          RETURN                                                      EDT 830
C                                                                     EDT 840
24        FORMAT (/,7X,5HCYCLE,8X,4HTIME,8X,4HDTNM,9X,3HJTS,6X,6HETOTAL,8X,4EDT 850
         1HJFIN,7X,5HJSTAR,7X,5HJSMAX,8X,4HSMAX,4X,8HX(JSMAX),/,I12,2E12.4,IEDT 860
         212,E12.4,3I12,2F12.4,/,8X,4HDTPP,6X,6HDTPULS,6X,6HEMVNEG,6X,6HEMVPEDT 870
         30S,7X,5HEMVPL,7X,5HEMVPR,7X,5HEMVPP,7X,5HEMVBM,6X,6HPDTPOS,6X,6HPDEDT 880
         4TNEG,/,10F12.4,/,8X,4HX(1),4X,8HX(JBND1),4X,8HX(JBND2),4X,8HX(JBNDEDT 890
         53),5X,7HX(JFIN),7X,5HJQMAX,8X,4HQMAX,4X,8HX(JQMAX),/,5E12.4,I12,2EEDT 900
         612.4)                                                       EDT 910
25        FORMAT (1H1)                                                EDT 920
          END                                                        EDT 930-
```

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      SUBROUTINE EQST (E1,D1,P1,M)                                    EOS   10
C                                                                     EOS   20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),VEOS   30
     10Z(801),ZM(801),TSPALL(801),US(100)                            EOS   40
C                                                                     EOS   50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6EOS   60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)EOS   70
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80EOS   80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),V0(6)            EOS   90
C                                                                     EOS  100
      COMMON CKS,C0,C1,DTN,DTNM,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTEOS  110
     1S,JZPUL,LINE,LOZHIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NEOS  120
     2TEDT,PDTNEG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE         EOS  130
C                                                                     EOS  140
      IF (D1) 2,1,2                                                   EOS  150
1     P1=0.                                                          EOS  160
      RETURN                                                         EOS  170
2     V1=RHO(M)/D1                                                   EOS  180
      ENU=D1/RHO(M)                                                  EOS  190
      EMU=ENU-1.                                                     EOS  200
      IF (EMU) 3,7,7                                                 EOS  210
C        EQST FOR EXPANDED ZONES                                     EOS  220
3     ENU2=EQSTN(M)*(1.-V1)*V1                                       EOS  230
      IF (ENU2+10.) 5,5,4                                            EOS  240
4     TS1=EQSTE(M)*(1.-EXP(ENU2))                                    EOS  250
      GO TO 6                                                        EOS  260
5     TS1=EQSTE(M)                                                   EOS  270
6     TS2=ENU*(EQSTH(M)+(EQSTG(M)-EQSTH(M))*SQRT(ENU))               EOS  280
      P1=(E1-TS1)*TS2*RHO(M)
      RETURN                                                         EOS  300
C        EQST FOR COMPRESSED ZONES                                   EOS  310
7     IF (CUSPA(M)) 10,10,8                                          EOS  320
8     ARG=EMU-CUSPA(M)                                               EOS  330
      IF (ARG) 10,10,9                                               EOS  340
C        TWO-WAVE SOLID EQUATION                                     EOS  350
9     TS2=(CUSP1(M)+((CUSPS(M)*ARG+CUSPD(M))*ARG+CUSPC(M))*ARG)*(1.-(CUSEOS  360
     1PG(M)*EMU)/2.)                                                 EOS  370
      GO TO 11                                                       EOS  380
C        ONE-WAVE SOLID EQUATION                                     EOS  390
10    TS2=((EQSTS(M)*EMU+EQSTD(M))*EMU+EQSTC(M))*EMU*(1.-(EQSTG(M)*EMU)/EOS  400
     12.)                                                            EOS  410
11    P1=TS2+E1*EQSTG(M)*D1                                          EOS  420
      RETURN                                                         EOS  430
      END                                                            EOS  440-
```

```
      SUBROUTINE SSCAL (NWHAT,EADD,J)                                    SSC   10
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YSSC  20
     107(801),ZM(801),TSPALL(801),US(100)
C                                                                        SSC   40
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6SSC  50
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)SSC  60
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80SSC  70
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),Y0(6)                SSC   80
C                                                                        SSC   90
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTSSC 100
     1S,JZPUL,LINE,LOZHI7,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NSSC 110
     2TEDT,PDTNEG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE            SSC  120
C                                                                        SSC  130
      EADD=0.                                                           SSC  140
      GO TO (1,11,16), NWHAT                                            SSC  150
C         ENERGY ADDITION ROUTINE FOR ACTIVE ZONES                      SSC  160
1     DO 10 I=1,NSPEC                                                   SSC  170
      IF (TIME-START(I)) 10,10,2                                        SSC  180
2     IF (TIME-DTNH-SSTOP(I)) 3,10,10                                   SSC  190
3     IF (J-2) 5,4,5                                                    SSC  200
4     SDURM=AMIN1(SDURM,SSTOP(I)-START(I))                             SSC  210
5     IF (TIME-DTNH-START(I)) 6,6,7                                     SSC  220
6     EADD=EADD+SS(J,I)*(TIME-START(I))                                SSC  230
      GO TO 10                                                          SSC  240
7     IF (TIME-SSTOP(I)) 8,8,9                                          SSC  250
8     EADD=EADD+SS(J,I)*DTNH                                           SSC  260
      GO TO 10                                                          SSC  270
9     EADD=EADD+SS(J,I)*(SSTOP(I)-TIME+DTNH)                           SSC  280
10    CONTINUE                                                          SSC  290
      RETURN                                                            SSC  300
C         ENERGY ADDITION ROUTINE FOR ADDING ZONES IN REZONE            SSC  310
11    DO 15 I=1,NSPEC                                                   SSC  320
      IF (TIME-SSTOP(I)) 12,14,14                                       SSC  330
12    IF (TIME-START(I)) 15,15,13                                       SSC  340
13    EADD=EADD+SS(J,I)*(TIME-START(I))                                SSC  350
      GO TO 15                                                          SSC  360
14    EADD=EADD+SS(J,I)*(SSTOP(I)-START(I))                           SSC  370
15    CONTINUE                                                          SSC  380
      RETURN                                                            SSC  390
C         ENERGY ADDITION ROUTINE FOR ADDING ZONES IN HYDRO             SSC  400
16    DO 20 I=1,NSPEC                                                   SSC  410
      IF (TIME-DTNH-SSTOP(I)) 17,19,19                                  SSC  420
17    IF (TIME-DTNH-START(I)) 20,20,18                                  SSC  430
18    EADD=EADD+SS(J,I)*(TIME-DTNH-START(I))                           SSC  440
      GO TO 20                                                          SSC  450
19    EADD=EADD+SS(J,I)*(SSTOP(I)-START(I))                           SSC  460
20    CONTINUE                                                          SSC  470
      RETURN                                                            SSC  480
      END                                                               SSC  490-
```

APPENDIX II

PUFF 66 TEST PROBLEM WITH FRACTURE

*** PUFF 66 SAMPLE PROBLEM WITH FRACTURE ***
***** THIS PROBLEM WAS RUN WITH PUFF 66 *****

NRZC	NMTRLS	JRZL	JZPUL	NPRIN	NTAPE	LOZMIZ	JFIN	JCYCS	NREZON
3	2	100	40	25	25	1	295	5000	25

ANGLE	TIME	CKS	TS
0.	1.000E-12	3.500E+00	5.552E-06

ZONING USED

RATIO 1.030E+00 TO ZONE 131
RATIO 1.100E-01 TO ZONE 132
RATIO 1.030E+00 TO ZONE 295

THE TEDITS ARE
5.000E-09 3.000E-08 5.000E-07 1.000E-06 2.000E-06

MATERIAL PROPERTIES FOR MATL1   RHO= 1.490E+00   FROM J= 1 TO J= 131   THICKNESS = 3.043E-01

EQSTC	EQSTD	EQSTE	EQSTG	EQSTH	EQSTS	EQSTN	PMIN
1.08790E+11	3.45091E+12	2.20000E+11	5.04000E+01	2.50000E-01	0.	6.58490E-01	-5.00000E+09

CUSP1	CUSPA	CUSPC	CUSPD	CUSPG	CUSPS
1.50000E+10	5.20300E-02	1.18370E+11	1.04660E+12	5.04000E-01	0.

YO	AMU	YADD	YMU
0.	0.	0.	0.

NOE = 17

AA	B	EDGE
6.11270E+02	-2.85220E+00	2.84000E-01
1.72630E+03	-2.85470E+00	4.00000E-01
1.74690E+03	-2.85470E+00	5.32000E-01
2.03820E+03	-2.85680E+00	2.47920E+00
2.03790E+03	-2.85830E+00	3.09900E+00
2.03730E+03	-2.85810E+00	4.13200E+00
2.03600E+03	-2.85770E+00	4.95840E+00
2.03390E+03	-2.85700E+00	6.19800E+00
2.02750E+03	-2.85530E+00	8.24400E+00
1.99240E+03	-2.84720E+00	1.54950E+01
3.00200E+02	-2.13200E+00	2.06600E+01
6.86840E+01	-1.64170E+00	2.47920E+01
1.70530E+01	-1.20770E+00	3.09900E+01
3.87450E+00	-7.76150E-01	4.13200E+01
1.88670E+00	-5.82710E-01	4.95840E+01
7.72300E-01	-5.54490E-01	6.19800E+01
6.16800E-01	-3.03550E-01	1.50000E+02

MATERIAL PROPERTIES FOR MATL2   RHO= 2.700E+00   FROM J= 131 TO J= 295   THICKNESS = 4.199E+00

EQSTC	EQSTD	EQSTE	EQSTG	EQSTH	EQSTS	EQSTN	PMIN
7.21600E+11	1.31336E+12	1.22000E+11	2.04000E+00	2.50000E-01	1.39735E+12	1.07305E+00	-1.00000E+10

CUSP1	CUSPA	CUSPC	CUSPD	CUSPG	CUSPS
0.	0.	0.	0.	0.	0.

YO 3.77900E+08   AMU 2.48900E+11   YADD 5.00000E+09   YMU 7.64000E-04

NOE = 7

AA	B	EDGE
9.76680E+02	-2.60820E+00	1.55900E+00
1.53680E+04	-2.77970E+00	3.09900E+01
3.16070E+03	-2.32260E+00	4.13200E+01
8.95120E+02	-1.98360E+00	4.95840E+01
1.72310E+02	-1.56150E+00	6.19800E+01
2.79320E+01	-1.12060E+00	8.26400E+01
2.58130E+00	-5.87580E-01	1.50000E+02

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TABLE VALUES
1.500E+00 4.500E+00 7.500E+00 1.050E+01 1.350E+01 1.650E+01 1.950E+01 2.250E+01 2.550E+01 2.850E+01

EITOT	NBR	START	SSTOP
7.780E+01	1	0.	5.000E-09

BLACK BODY INPUT

TEMPERATURE	ENERGY
-0.	-0.

TABLE VALUES
6.287E-01 8.118E-01 9.464E-01 1.058E+00 1.155E+00 1.242E+00 1.322E+00 1.397E+00 1.468E+00 1.535E+00
1.599E+00 1.660E+00 1.720E+00 1.777E+00 1.833E+00 1.888E+00 1.942E+00 1.994E+00 2.046E+00 2.096E+00
2.146E+00 2.194E+00 2.244E+00 2.292E+00 2.340E+00 2.388E+00 2.435E+00 2.481E+00 2.528E+00 2.574E+00
2.620E+00 2.666E+00 2.712E+00 2.757E+00 2.803E+00 2.849E+00 2.895E+00 2.940E+00 2.986E+00 3.032E+00
3.078E+00 3.124E+00 3.171E+00 3.217E+00 3.264E+00 3.311E+00 3.359E+00 3.406E+00 3.454E+00 3.503E+00
3.552E+00 3.601E+00 3.651E+00 3.701E+00 3.752E+00 3.804E+00 3.856E+00 3.908E+00 3.962E+00 4.016E+00
4.071E+00 4.127E+00 4.184E+00 4.242E+00 4.300E+00 4.360E+00 4.421E+00 4.484E+00 4.548E+00 4.613E+00
4.680E+00 4.748E+00 4.818E+00 4.891E+00 4.965E+00 5.042E+00 5.121E+00 5.203E+00 5.288E+00 5.376E+00
5.468E+00 5.563E+00 5.664E+00 5.749E+00 5.880E+00 5.997E+00 6.122E+00 6.255E+00 6.396E+00 6.553E+00
6.723E+00 6.909E+00 7.119E+00 7.357E+00 7.634E+00 7.968E+00 8.390E+00 8.972E+00 9.942E+00 1.089E+01
1.025E+01 1.043E+01 1.064E+01 1.088E+01 1.118E+01 1.157E+01 1.210E+01 1.303E+01 1.500E+01

EITOT	NBR	START	SSTOP
6.	1	0.	3.000E-08

BLACK BODY INPUT

TEMPERATURE	ENERGY
1.000E+00	2.000E+01

SPALL STRENGTH OF INDIVIDUAL ZONES

1. TSPALL(131)= 0.

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*** PUFF 46 SAMPLE PROBLE- WITH FRACTURE ***

J	DX	X	ERGS	CAL	SUM CAL	ERGS/GM	YOZ	ZONE MASS	J
2	2.00000E-04	2.00000E-04	5.81985E+07	1.39031E+00	1.39031E+00	1.95297E+11	0.	2.98000E-04	2
3	2.06000E-04	4.06000E-04	4.09884E+07	9.79178E-01	2.36949E+00	1.33539E+11	0.	3.06940E-04	3
4	2.12180E-04	6.14180E-04	3.44342E+07	8.22698E-01	3.19219E+00	1.08930E+11	0.	3.16140E-04	4
5	2.18545E-04	8.36725E-04	3.07315E+07	7.34151E-01	3.92634E+00	9.43749E+10	0.	3.25633E-04	5
6	2.25102E-04	1.04183E-03	2.82525E+07	6.74926E-01	4.60127E+00	8.42347E+10	0.	3.35402E-04	6
7	2.31855E-04	1.20368E-03	2.64555E+07	6.32000E-01	5.23327E+00	7.65797E+10	0.	3.45464E-04	7
8	2.38810E-04	1.53249E-03	2.50874E+07	5.99316E-01	5.83256E+00	7.05043E+10	0.	3.55828E-04	8
9	2.45975E-04	1.77847E-03	2.40104E+07	5.73588E-01	6.40617E+00	6.55122E+10	0.	3.66502E-04	9
10	2.53356E-04	2.03192E-03	2.31422E+07	5.52848E-01	6.95902E+00	6.13043E+10	0.	3.77497E-04	10
11	2.60958E-04	2.29778E-03	2.24301E+07	5.35835E-01	7.49485E+00	5.76872E+10	0.	3.88822E-04	11
12	2.68783E-04	2.56156E-03	2.18383E+07	5.21698E-01	8.01655E+00	5.45293E+10	0.	4.00487E-04	12
13	2.76847E-04	2.83413E-03	2.13417E+07	5.09835E-01	8.52639E+00	5.17372E+10	0.	4.12502E-04	13
14	2.85152E-04	3.12355E-03	2.09219E+07	4.99808E-01	9.02619E+00	4.92424E+10	0.	4.24877E-04	14
15	2.93707E-04	3.41726E-03	2.05653E+07	4.91288E-01	9.51748E+00	4.69933E+10	0.	4.37623E-04	15
16	3.02518E-04	3.71878E-03	2.02613E+07	4.84025E-01	1.00015E+01	4.49500E+10	0.	4.50752E-04	16
17	3.11593E-04	4.03138E-03	2.00016E+07	4.77821E-01	1.04793E+01	4.30814E+10	0.	4.64274E-04	17
18	3.20941E-04	4.35232E-03	1.97797E+07	4.72519E-01	1.09518E+01	4.13625E+10	0.	4.78203E-04	18
19	3.30570E-04	4.68288E-03	1.95902E+07	4.67903E-01	1.14190E+01	3.97731E+10	0.	4.92549E-04	19
20	3.40487E-04	5.02337E-03	1.94280E+07	4.64138E-01	1.18440E+01	3.82966E+10	0.	5.07325E-04	20
21	3.50701E-04	5.37407E-03	1.92919E+07	4.60868E-01	1.23440E+01	3.69192E+10	0.	5.22545E-04	21
22	3.61222E-04	5.73530E-03	1.91766E+07	4.58112E-01	1.28003E+01	3.56295E+10	0.	5.38221E-04	22
23	3.72059E-04	4.10736E-03	1.90801E+07	4.55807E-01	1.32586E+01	3.44177E+10	0.	5.54368E-04	23
24	3.83221E-04	6.49058E-03	1.90003E+07	4.53001E-01	1.37127E+01	3.32755E+10	0.	5.70999E-04	24
25	3.94717E-04	6.84528E-03	1.89353E+07	4.52349E-01	1.41650E+01	3.21959E+10	0.	5.88129E-04	25
26	4.06558E-04	7.29185E-03	1.88835E+07	4.51111E-01	1.46161E+01	3.11726E+10	0.	6.05773E-04	26
27	4.18754E-04	7.71061E-03	1.88434E+07	4.50153E-01	1.50663E+01	3.02004E+10	0.	6.23946E-04	27
28	4.31316E-04	8.14193E-03	1.88137E+07	4.49444E-01	1.55157E+01	2.92746E+10	0.	6.42664E-04	28
29	4.44259E-04	8.58418E-03	1.87933E+07	4.48965E-01	1.59647E+01	2.83911E+10	0.	6.61944E-04	29
30	4.57586E-04	9.04377E-03	1.87811E+07	4.48690E-01	1.64135E+01	2.75463E+10	0.	6.81802E-04	30
31	4.71313E-04	9.51504E-03	1.87763E+07	4.48608E-01	1.68619E+01	2.67371E+10	0.	7.02257E-04	31
32	4.85452E-04	1.00005E-02	1.87779E+07	4.48800E-01	1.73105E+01	2.59605E+10	0.	7.23324E-04	32
33	5.00016E-04	1.04500E-02	1.87852E+07	4.48762E-01	1.77592E+01	2.52142E+10	0.	7.45024E-04	33
34	5.15017E-04	1.10154E-02	1.87975E+07	4.49055E-01	1.82083E+01	2.44958E+10	0.	7.67375E-04	34
35	5.30467E-04	1.15460E-02	1.88141E+07	4.49452E-01	1.86578E+01	2.38034E+10	0.	7.90396E-04	35
36	5.46381E-04	1.20926E-02	1.88344E+07	4.49936E-01	1.91077E+01	2.31350E+10	0.	8.14108E-04	36
37	5.62772E-04	1.26552E-02	1.88579E+07	4.50500E-01	1.95582E+01	2.24892E+10	0.	8.38531E-04	37
38	5.79656E-04	1.32344E-02	1.88841E+07	4.51124E-01	2.00093E+01	2.18645E+10	0.	8.63687E-04	38
39	5.97005E-04	1.38319E-02	1.89123E+07	4.51800E-01	2.04611E+01	2.12594E+10	0.	8.89598E-04	39
40	6.14957E-04	1.44448E-02	1.89423E+07	4.52515E-01	2.09136E+01	2.06729E+10	0.	9.16285E-04	40
41	6.33056E-04	1.50803E-02	1.89735E+07	4.53261E-01	2.13669E+01	2.01038E+10	0.	9.43776E-04	41
42	6.52608E-04	1.57327E-02	1.90055E+07	4.54026E-01	2.18209E+01	1.95513E+10	0.	9.72087E-04	42
43	6.71903E-04	1.64046E-02	1.90380E+07	4.55580E-01	2.22757E+01	1.90142E+10	0.	1.00125E-03	43
44	6.92139E-04	1.70986E-02	1.90709E+07	4.56353E-01	2.27313E+01	1.84920E+10	0.	1.03129E-03	44
45	7.12603E-04	1.78097E-02	1.91028E+07	4.57112E-01	2.31877E+01	1.79839E+10	0.	1.06223E-03	45
46	7.32606E-04	1.85460E-02	1.91656E+07	4.57850E-01	2.36448E+01	1.74891E+10	0.	1.09409E-03	46
47	7.56319E-04	1.93003E-02	1.91954E+07	4.58562E-01	2.41026E+01	1.70071E+10	0.	1.12692E-03	47
48	7.79056E-04	2.00793E-02	1.92234E+07	4.59240E-01	2.45612E+01	1.65374E+10	0.	1.16072E-03	48
49	8.02379E-04	2.08817E-02	1.92338E+07	4.59204E-01	2.50204E+01	1.60795E+10	0.	1.19554E-03	49
50	8.26650E-04	2.17081E-02	1.92506E+07	4.59860E-01	2.54803E+01	1.56329E+10	0.	1.23141E-03	50

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*** PUFF 4A SAMPLE PROBLEM WITH FRACTURE ***

  J      DX            X            ERGS          CAL          SUM CAL       ERGS/GM        YOZ        ZONE MASS     J

 51   8.51244E-04   2.25594E-02   1.92755E+07   4.60476E-01   2.59408E+01   1.51973E+10   0.          1.26835E-03   51
 52   8.76781E-04   2.34362E-02   1.92985E+07   4.61025E-01   2.64018E+01   1.47722E+10   0.          1.30640E-03   52
 53   9.03085E-04   2.43392E-02   1.93193E+07   4.61521E-01   2.68633E+01   1.43574E+10   0.          1.34560E-03   53
 54   9.30177E-04   2.52694E-02   1.93377E+07   4.61962E-01   2.73253E+01   1.39526E+10   0.          1.38596E-03   54
 55   9.58082E-04   2.62275E-02   1.93538E+07   4.62345E-01   2.77876E+01   1.35574E+10   0.          1.42754E-03   55
 56   9.86825E-04   2.72143E-02   1.93673E+07   4.62668E-01   2.82503E+01   1.31717E+10   0.          1.47037E-03   56
 57   1.01643E-03   2.82304E-02   1.93782E+07   4.62929E-01   2.87132E+01   1.27953E+10   0.          1.51448E-03   57
 58   1.04692E-03   2.92777E-02   1.93865E+07   4.63126E-01   2.91763E+01   1.24279E+10   0.          1.55991E-03   58
 59   1.07833E-03   3.03560E-02   1.93921E+07   4.63260E-01   2.96396E+01   1.20694E+10   0.          1.60671E-03   59
 60   1.11068E-03   3.14667E-02   1.93950E+07   4.63331E-01   3.01029E+01   1.17197E+10   0.          1.65491E-03   60
 61   1.14400E-03   3.26107E-02   1.93954E+07   4.63340E-01   3.05663E+01   1.13785E+10   0.          1.70456E-03   61
 62   1.17832E-03   3.37890E-02   1.93932E+07   4.63287E-01   3.10296E+01   1.10459E+10   0.          1.75570E-03   62
 63   1.21367E-03   3.50027E-02   1.93886E+07   4.63176E-01   3.14927E+01   1.07216E+10   0.          1.80837E-03   63
 64   1.25008E-03   3.62528E-02   1.93816E+07   4.63009E-01   3.19558E+01   1.04055E+10   0.          1.86262E-03   64
 65   1.28758E-03   3.75403E-02   1.93724E+07   4.62789E-01   3.24185E+01   1.00977E+10   0.          1.91850E-03   65
 66   1.32621E-03   3.88666E-02   1.93611E+07   4.62521E-01   3.28811E+01   9.79787E+09   0.          1.97605E-03   66
 67   1.36600E-03   4.02325E-02   1.93480E+07   4.62208E-01   3.33433E+01   9.50606E+09   0.          2.03533E-03   67
 68   1.40690E-03   4.16395E-02   1.93333E+07   4.61856E-01   3.38051E+01   9.22216E+09   0.          2.09639E-03   68
 69   1.44919E-03   4.30887E-02   1.93172E+07   4.61471E-01   3.42666E+01   8.94609E+09   0.          2.15929E-03   69
 70   1.49266E-03   4.45814E-02   1.92999E+07   4.61059E-01   3.47277E+01   8.67777E+09   0.          2.22407E-03   70
 71   1.53744E-03   4.61188E-02   1.92818E+07   4.60626E-01   3.51883E+01   8.41711E+09   0.          2.29079E-03   71
 72   1.58356E-03   4.77024E-02   1.92632E+07   4.60180E-01   3.56485E+01   8.16405E+09   0.          2.35951E-03   72
 73   1.63107E-03   4.93334E-02   1.92442E+07   4.59729E-01   3.61082E+01   7.91848E+09   0.          2.43030E-03   73
 74   1.68000E-03   5.10135E-02   1.92254E+07   4.59279E-01   3.65675E+01   7.68032E+09   0.          2.50321E-03   74
 75   1.73040E-03   5.27439E-02   1.92070E+07   4.58840E-01   3.70263E+01   7.44949E+09   0.          2.57830E-03   75
 76   1.78232E-03   5.45262E-02   1.91894E+07   4.58418E-01   3.74847E+01   7.22587E+09   0.          2.65565E-03   76
 77   1.83579E-03   5.63620E-02   1.91727E+07   4.58023E-01   3.79428E+01   7.00937E+09   0.          2.73532E-03   77
 78   1.89086E-03   5.82528E-02   1.91578E+07   4.57664E-01   3.84004E+01   6.79986E+09   0.          2.81738E-03   78
 79   1.94750E-03   6.02004E-02   1.91446E+07   4.57347E-01   3.88578E+01   6.59724E+09   0.          2.90190E-03   79
 80   2.00601E-03   6.22064E-02   1.91334E+07   4.57082E-01   3.93148E+01   6.40137E+09   0.          2.98896E-03   80
 81   2.06619E-03   6.42726E-02   1.91248E+07   4.56875E-01   3.97717E+01   6.21212E+09   0.          3.07863E-03   81
 82   2.12818E-03   6.64008E-02   1.91190E+07   4.56736E-01   4.02285E+01   6.02935E+09   0.          3.17099E-03   82
 83   2.19202E-03   6.85928E-02   1.91162E+07   4.56671E-01   4.06851E+01   5.85290E+09   0.          3.26611E-03   83
 84   2.25778E-03   7.08506E-02   1.91169E+07   4.56686E-01   4.11418E+01   5.68262E+09   0.          3.36410E-03   84
 85   2.325[illegible]E-03   7.31761E-02   1.91212E+07   4.56789E-01   4.15986E+01   5.51834E+09   0.          3.46502E-03   85
 86   2.39[illegible]-03   7.55714E-02   1.91293E+07   4.56983E-01   4.20556E+01   5.35989E+09   0.          3.56897E-03   86
 87   2.4671[illegible]-03   7.80385E-02   1.91415E+07   4.57274E-01   4.25129E+01   5.20710E+09   0.          3.67604E-03   87
 88   2.5411[illegible]-03   8.05797E-02   1.91579E+07   4.57666E-01   4.29705E+01   5.05977E+09   0.          3.78632E-03   88
 89   2.6173[illegible]-03   8.31971E-02   1.91786E+07   4.58162E-01   4.34287E+01   4.91771E+09   0.          3.89991E-03   89
 90   2.69591E-03   8.58930E-02   1.92038E+07   4.58763E-01   4.38874E+01   4.78074E+09   0.          4.01691E-03   90
 91   2.77679E-03   8.86698E-02   1.92334E+07   4.59471E-01   4.43469E+01   4.64866E+09   0.          4.13742E-03   91
 92   2.86009E-03   9.15299E-02   1.92675E+07   4.60285E-01   4.48072E+01   4.52126E+09   0.          4.26154E-03   92
 93   2.94590E-03   9.44758E-02   1.93061E+07   4.61205E-01   4.52684E+01   4.39835E+09   0.          4.38939E-03   93
 94   3.03427E-03   9.75100E-02   1.93489E+07   4.62229E-01   4.57306E+01   4.27972E+09   0.          4.52107E-03   94
 95   3.12530E-03   1.00635E-01   1.93960E+07   4.63354E-01   4.61940E+01   4.16518E+09   0.          4.65670E-03   95
 96   3.21906E-03   1.03854E-01   1.94471E+07   4.64575E-01   4.66586E+01   4.05452E+09   0.          4.79640E-03   96
 97   3.31563E-03   1.07170E-01   1.95020E+07   4.65887E-01   4.71245E+01   3.94755E+09   0.          4.94029E-03   97
 98   3.41510E-03   1.10585E-01   1.95605E+07   4.67285E-01   4.75917E+01   3.84407E+09   0.          5.08850E-03   98
 99   3.51755E-03   1.14103E-01   1.96223E+07   4.68761E-01   4.80605E+01   3.74390E+09   0.          5.24116E-03   99
100   3.62308E-03   1.17726E-01   1.96871E+07   4.70309E-01   4.85308E+01   3.64685E+09   0.          5.39839E-03  100
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*** PUFF 46 SAMPLE PROBLEM WITH FRACTURE ***

J	ZONE MASS	V0Z	ERGS/GM	SUM CAL	CAL	ERGS	R	DI	J
101	5.56036E-03	0.	3.55275E-09	4.90027E-01	4.71919E-01	1.97545E-07	1.21650E-01	3.73177E-01	101
102	5.72715E-03	0.	3.46144E-09	4.94763E-01	4.75283E-01	1.98242E-07	1.25301E-01	3.66373E-01	102
103	5.08997E-03	0.	3.37274E-09	4.99516E-01	4.75291E-01	1.98957E-07	1.27260E-01	3.65906E-01	103
104	6.07596E-03	0.	3.28651E-09	5.04286E-01	4.77033E-01	1.99604E-07	1.33328E-01	4.20010E-01	104
105	6.25821E-03	0.	3.20261E-09	5.09074E-01	4.78601E-01	2.00424E-07	1.37040E-01	4.32601E-03	105
106	6.44590E-03	0.	3.12089E-09	5.13880E-01	4.80582E-01	2.01170E-07	1.41806E-01	4.32035E-03	106
107	6.63936E-03	0.	3.04125E-09	5.18704E-01	4.82147E-01	2.01919E-07	1.45038E-01	4.50919E-03	107
108	4.83452E-03	0.	2.94356E-09	5.23545E-01	4.84147E-01	2.02664E-07	1.50010E-01	4.72730E-01	108
109	7.04367E-03	0.	2.84773E-09	5.28404E-01	4.85910E-01	2.03602E-07	1.54437E-01	4.60012E-01	109
110	7.25499E-03	0.	2.81364E-09	5.33281E-01	4.87648E-01	2.04129E-07	1.65966E-01	4.60012E-03	110
111	7.47263E-03	0.	2.74123E-09	5.38174E-01	4.89351E-01	2.04842E-07	1.65522E-01	5.01519E-03	111
112	7.69681E-03	0.	2.67042E-09	5.43085E-01	4.91010E-01	2.05537E-07	1.70687E-01	5.16545E-03	112
113	7.92772E-03	0.	2.60113E-09	5.48011E-01	4.92619E-01	2.06210E-07	1.70008E-01	5.32022E-03	113
114	8.16555E-03	0.	2.53331E-09	5.52752E-01	4.94160E-01	2.06859E-07	1.81800E-01	5.04626E-03	114
115	8.41052E-03	0.	2.46691E-09	5.57009E-01	4.95651E-01	2.07480E-07	1.87132E-01	5.04484E-03	115
116	8.66203E-03	0.	2.40189E-09	5.62080E-01	4.97066E-01	2.08072E-07	1.92047E-01	5.81380E-03	116
117	8.92272E-03	0.	2.33821E-09	5.67064E-01	4.98403E-01	2.08631E-07	2.04235E-01	5.80005E-03	117
118	9.19040E-03	0.	2.27563E-09	5.72060E-01	4.99660E-01	2.09150E-07	2.05103E-01	4.16005E-03	118
119	9.46611E-03	0.	2.21473E-09	5.77069E-01	5.00834E-01	2.09645E-07	2.11566E-01	4.35309E-01	119
120	9.75009E-03	0.	2.15490E-09	5.82008E-01	5.01921E-01	2.10102E-07	2.16000E-01	4.36309E-01	120
121	1.00426E-02	0.	2.09630E-09	5.87971E-01	5.02923E-01	2.10523E-07	2.26703E-01	4.74000E-01	121
122	1.13030E-02	0.	2.03893E-09	5.92955E-01	5.03833E-01	2.10905E-07	2.31942E-01	4.42200E-01	122
123	1.06542E-02	0.	1.98278E-09	5.98002E-01	5.04655E-01	2.11240E-07	2.36336E-01	7.150066E-01	123
124	1.09738E-02	0.	1.92782E-09	6.03056E-01	5.05309E-01	2.11590E-07	2.41947E-01	7.36468E-01	124
125	1.13030E-02	0.	1.87407E-09	6.08116E-01	5.06035E-01	2.11826E-07	2.53703E-01	7.00000E-01	125
126	1.16421E-02	0.	1.82150E-09	6.13182E-01	5.06595E-01	2.12041E-07	2.61597E-01	7.61350E-01	126
127	1.19914E-02	0.	1.77010E-09	6.18253E-01	5.07071E-01	2.12260E-07	2.69655E-01	8.04791E-01	127
128	1.23511E-02	0.	1.71988E-09	6.23276E-01	5.07464E-01	2.12424E-07	2.77303E-01	7.38035E-01	128
129	1.27217E-02	0.	1.67082E-09	6.28265E-01	5.07777E-01	2.12556E-07	2.86472E-01	8.53803E-01	129
130	1.31033E-02	0.	1.62290E-09	6.33005E-01	5.08013E-01	2.12654E-07	2.95266E-01	7.79417E-01	130
131	1.34964E-02	3.77900E+08	1.57613E-09	6.38567E-01	8.32295E-01	1.12721E-07	3.05121E-01	8.05799E-01	131
132	2.69022E-03	3.77900E+08	1.29505E-10	6.44800E-01	8.14263E-01	3.48090E-07	3.06347E-01	1.02027E-03	132
133	2.77093E-03	3.77900E+08	1.23009E-10	6.55033E-01	7.07072E-01	1.33655E-07	3.07004E-01	1.05706E-03	133
134	2.85406E-03	3.77900E+08	1.16905E-10	6.63003E-01	7.08690E-01	7.26708E-07	3.09063E-01	1.08077E-03	134
135	2.93909E-03	3.77900E+08	1.11164E-10	6.70810E-01	7.60880E-01	3.20228E-07	3.06167E-01	1.21163E-03	135
136	3.02787E-03	3.77900E+08	1.05760E-10	6.78660E-01	7.50005E-01	3.13603E-07	3.17697E-01	1.15508E-03	136
137	3.11871E-03	3.77900E+08	1.00667E-10	6.85960E-01	7.35637E-01	7.07932E-07	3.11059E-01	1.18973E-03	137
138	3.21227E-03	3.77900E+08	9.58631E-09	6.93316E-01	7.21842E-01	3.02163E-07	3.13185E-01	1.20542E-03	138
139	3.30864E-03	3.77900E+08	9.13256E-09	7.00535E-01	7.13256E-01	2.96490E-07	3.16447E-01	1.25425E-03	139
140	3.40790E-03	3.77900E+08	8.70351E-09	7.07620E-01	7.08568E-01	2.91243E-07	3.17900E-01	1.28210E-03	140
141	3.51013E-03	3.77900E+08	8.29732E-09	7.14578E-01	6.95764E-01	2.86065E-07	3.18844E-01	1.30005E-03	141
142	3.61544E-03	3.77900E+08	7.91231E-09	7.21412E-01	6.83304E-01	2.91124E-07	3.18665E-01	1.37022E-03	142
143	3.72390E-03	3.77900E+08	7.54694E-09	7.28126E-01	6.71382E-01	2.81000E-07	3.18400E-01	1.42060E-03	143
144	3.83562E-03	3.77900E+08	7.19080E-09	7.34723E-01	6.59715E-01	2.76157E-07	3.18808E-01	1.46322E-03	144
145	3.95068E-03	3.77900E+08	6.86961E-09	7.41206E-01	6.48343E-01	2.71307E-07	3.21360E-01	1.50711E-03	145
146	4.06921E-03	3.77900E+08	6.55521E-09	7.47579E-01	6.37231E-01	2.66765E-07	3.22566E-01	1.52333E-03	146
147	4.19128E-03	3.77900E+08	6.25555E-09	7.53842E-01	6.26344E-01	2.62100E-07	3.24000E-01	1.59892E-03	147
148	4.31702E-03	3.77900E+08	5.96969E-09	7.59999E-01	6.15655E-01	2.57713E-07	3.24002E-01	1.64606E-03	148
149	4.44653E-03	3.77900E+08	5.69677E-09	7.66050E-01	6.05133E-01	2.53309E-07	3.27450E-01	1.64606E-03	149
150	4.57993E-03	3.77900E+08	5.43603E-09	7.71988E-01	5.94759E-01	2.48966E-07	3.29596E-01	1.00627E-01	150

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J	DT	X	ERGS	CAL	SUM CAL	ERGS/GM	YOZ	ZONE MASS	J
151	1.74714E-01	3.31049E-01	2.46677E-07	5.44512E-01	7.77863E-01	5.18677E+09	3.77900E+08	4.71732E-03	151
152	1.79057E-03	3.32497E-01	2.40433E-07	5.74375E-01	7.83586E-01	4.94837E+09	3.77900E+08	4.85804E-03	152
153	1.85356E-03	3.34751E-01	2.36230E-07	5.85230E-01	7.80230E-01	4.72026E+09	3.77900E+08	5.00461E-03	153
154	1.90917E-03	3.34660E-01	2.32065E-07	5.54379E-01	7.94774E-01	4.50193E+09	3.77900E+08	5.15479E-03	154
155	1.96644E-03	3.36226E-01	2.27927E-07	5.44499E-01	8.00219E-01	4.29291E+09	3.77900E+08	5.30939E-03	155
156	2.02543E-03	3.44552E-01	2.19740E-07	5.34888E-01	8.05565E-01	4.09278E+09	3.77900E+08	5.46867E-03	156
157	2.08620E-03	3.47738E-01	2.19740E-07	5.24941E-01	8.10815E-01	3.90113E+09	3.77900E+08	5.63273E-03	157
158	2.14878E-03	3.46887E-01	2.15685E-07	5.13253E-01	8.15967E-01	3.71761E+09	3.77900E+08	5.80171E-03	158
159	2.21325E-03	3.47100E-01	2.11653E-07	5.05621E-01	8.21024E-01	3.54186E+09	3.77900E+08	5.97576E-03	159
160	2.28403E-03	3.50300E-01	2.07646E-07	4.96044E-01	8.25806E-01	3.37356E+09	3.77900E+08	6.15504E-03	160
161	2.34803E-03	3.51288E-01	2.03650E-07	4.86521E-01	8.30609E-01	3.21242E+09	3.77900E+08	6.33969E-03	161
162	2.41847E-01	3.55144E-01	1.99693E-07	4.77049E-01	8.35420E-01	3.05814E+09	3.77900E+08	6.52988E-03	162
163	2.48103E-03	3.54337E-01	1.95758E-07	4.67629E-01	8.40298E-01	2.91044E+09	3.77900E+08	6.72578E-03	163
164	2.56574E-03	3.59203E-01	1.91826E-07	4.58260E-01	8.44819E-01	2.76906E+09	3.77900E+08	6.92755E-03	164
165	2.62273E-03	3.61244E-01	1.87927E-07	4.46442E-01	8.49366E-01	2.63374E+09	3.77900E+08	7.13538E-03	165
166	2.72201E-03	3.45848E-01	1.84047E-07	4.39673E-01	8.53765E-01	2.50423E+09	3.77900E+08	7.34944E-03	166
167	2.80367E-03	3.73771E-01	1.80100E-07	4.30454E-01	8.58049E-01	2.38032E+09	3.77900E+08	7.56992E-03	167
168	2.80778E-03	3.70259E-01	1.76349E-07	4.21264E-01	8.62282E-01	2.26175E+09	3.77900E+08	7.79702E-03	168
169	2.97442E-03	3.72230E-01	1.72531E-07	4.12162E-01	8.66404E-01	2.14833E+09	3.77900E+08	8.03093E-03	169
170	3.06365E-03	3.74297E-01	1.68730E-07	4.03007E-01	8.70435E-01	2.03984E+09	3.77900E+08	8.27185E-03	170
171	3.15550E-03	3.79603E-01	1.66953E-07	3.94060E-01	8.74375E-01	1.93607E+09	3.77900E+08	8.52001E-03	171
172	3.25023E-03	3.87203E-01	1.61196E-07	3.85079E-01	8.78226E-01	1.83684E+09	3.77900E+08	8.77561E-03	172
173	3.34773E-03	3.46051E-01	1.57654E-07	3.78144E-01	8.81987E-01	1.74196E+09	3.77900E+08	9.03888E-03	173
174	3.44817E-01	3.84698E-01	1.53733E-07	3.67256E-01	8.85660E-01	1.65126E+09	3.77900E+08	9.31005E-03	174
175	3.55161E-01	3.93050E-01	1.50032E-07	3.56314E-01	8.89244E-01	1.56457E+09	3.77900E+08	9.58935E-03	175
176	3.65816E-03	3.76700E-01	1.46350E-07	3.40619E-01	8.92740E-01	1.48173E+09	3.77900E+08	9.87793E-03	176
177	3.76700E-01	3.66373E-01	1.42689E-07	3.40722E-01	8.96149E-01	1.40258E+09	3.77900E+08	1.01733E-02	177
178	3.84377E-03	4.06357E-01	1.39048E-07	3.32173E-01	8.99471E-01	1.32698E+09	3.77900E+08	1.04785E-02	178
179	3.84377E-03	4.08355E-01	1.35428E-07	3.23526E-01	9.02706E-01	1.25479E+09	3.77900E+08	1.07929E-02	179
180	4.11729E-01	4.12672E-01	1.31830E-07	3.14031E-01	9.05855E-01	1.18588E+09	3.77900E+08	1.11167E-02	180
181	4.26001E-03	4.16713E-01	1.28254E-07	3.06192E-01	9.08919E-01	1.12012E+09	3.77900E+08	1.14502E-02	181
182	4.34003E-03	4.21001E-01	1.24705E-07	2.97111E-01	9.20333E-01	1.05739E+09	3.77900E+08	1.17937E-02	182
183	4.44037E-01	4.25800E-01	1.21181E-07	2.84611E-01	9.22979E-01	9.97578E+08	3.77900E+08	1.21475E-02	183
184	4.63405E-01	4.30210E-01	1.17683E-07	2.81135E-01	9.17605E-01	9.40566E+08	3.77900E+08	1.25119E-02	184
185	4.63401E-01	4.34060E-01	1.14214E-07	2.72848E-01	9.20333E-01	8.86255E+08	3.77900E+08	1.28873E-02	185
186	4.77307E-03	4.38603E-01	1.10779E-07	2.66633E-01	9.22979E-01	8.34535E+08	3.77900E+08	1.32739E-02	186
187	4.91626E-03	4.38347E-01	1.07340E-07	2.56482E-01	9.25564E-01	7.85309E+08	3.77900E+08	1.36721E-02	187
188	5.06175E-03	5.01434E-01	1.03993E-07	2.46635E-01	9.28029E-01	7.38482E+08	3.77900E+08	1.40823E-02	188
189	5.21566E-03	5.55555E-01	1.00657E-07	2.40461E-01	9.30433E-01	6.93960E+08	3.77900E+08	1.45047E-02	189
190	5.37213E-03	5.61680E-01	9.73564E-08	2.32759E-01	9.32759E-01	6.51654E+08	3.77900E+08	1.49399E-02	190
191	5.53329E-03	5.69290E-01	9.40477E-08	2.24784E-01	9.35097E-01	6.11477E+08	3.77900E+08	1.53881E-02	191
192	5.87027E-03	4.72558E-01	9.07362E-08	2.17089E-01	9.37178E-01	5.73345E+08	3.77900E+08	1.58497E-02	192
193	6.04638E-01	4.78704E-01	8.74350E-08	2.04966E-01	9.39273E-01	5.37175E+08	3.77900E+08	1.63252E-02	193
194	6.22777E-01	4.80325E-01	8.45604E-08	2.02089E-01	9.41209E-01	5.02809E+08	3.77900E+08	1.68150E-02	194
195	6.41660E-01	4.91307E-01	8.14721E-06	1.94630E-01	9.43239E-01	4.70409E+08	3.77900E+08	1.73196E-02	195
196	6.67046E-01	4.97654E-01	7.84310E-06	1.87365E-01	9.45113E-01	4.39660E+08	3.77900E+08	1.78390E-02	196
197	6.80525E-01	5.11766E-01	7.56391E-06	1.80210E-01	9.46647E-01	4.10571E+08	3.77900E+08	1.83742E-02	197
198	7.00641E-01	5.11746E-01	7.24678E-06	1.73101E-01	9.48647E-01	3.83071E+08	3.77900E+08	1.89254E-02	198
199	7.21849E-03	5.10090E-01	6.96086E-06	1.66289E-01	9.50310E-01	3.57092E+08	3.77900E+08	1.94932E-02	199
200	7.36290E-01	5.24260E-01	6.67731E-06	1.59515E-01	9.51905E-01	3.32569E+08	3.77900E+08	2.00780E-02	200

J	DX	X	ERGS	CAL	SUM CAL	ERGS/GM	YOZ	ZONE MASS	J
201	7.65937E-03	5.34784E-01	6.39926E+06	1.52873E-01	9.53434E+01	3.09437E+08	3.77900E+08	2.06803E-02	201
202	7.89915E-03	5.41973E-01	6.12685E+06	4.16365E-01	9.54897E+01	2.87636E+08	3.77900E+08	2.13007E-02	202
203	8.12583E-03	5.50099E-01	5.86021E+06	1.39995E-01	9.56297E+01	2.67156E+08	3.77900E+08	2.19397E-02	203
204	8.36960E-03	5.58468E-01	5.59946E+06	1.37766E-01	9.57635E+01	2.47786E+08	3.77900E+08	2.25979E-02	204
205	8.52069E-03	5.67089E-01	5.34473E+06	1.27681E-01	9.58912E+01	2.29625E+08	3.77905E+08	2.32759E-02	205
206	8.87931E-03	5.75969E-01	5.09612E+06	1.21742E-01	9.60129E+01	2.12568E+08	3.77900E+08	2.39741E-02	206
207	9.14569E-03	5.85114E-01	4.85376E+06	1.59952E-01	9.61289E+01	1.96560E+08	3.77900E+08	2.46934E-02	207
208	9.42006E-03	5.94534E-01	4.61750E+06	1.10308E-01	9.62392E+01	1.81547E+08	3.77900E+08	2.54342E-02	208
209	9.70266E-03	6.04237E-01	4.38792E+06	1.04824E-01	9.63440E+01	1.67496E+08	3.77900E+08	2.61972E-02	209
210	9.99374E-03	6.14230E-01	4.16449E+06	9.94746E-02	9.64435E+01	1.54350E+08	3.77900E+08	2.69831E-02	210
211	1.02935E-02	6.24524E-01	3.94833E+06	9.43222E-02	9.65378E+01	1.42064E+08	3.77900E+08	2.77926E-02	211
212	1.06024E-02	6.35126E-01	3.73844E+06	8.93083E-02	9.66271E+01	1.30544E+08	3.77900E+08	2.86264E-02	212
213	1.09204E-02	6.46047E-01	3.53529E+06	8.44539E-02	9.67116E+01	1.19899E+08	3.77900E+08	2.94852E-02	213
214	1.12480E-02	6.57295E-01	3.33874E+06	7.97599E-02	9.67913E+01	1.03697E+08	3.77900E+08	3.03697E-02	214
215	1.15855E-02	6.68880E-01	3.14900E+06	7.52271E-02	9.68666E+01	1.00669E+08	3.77900E+08	3.12806E-02	215
216	1.19331E-02	6.80813E-01	2.96602E+06	7.08556E-02	9.69374E+01	9.20573E+07	3.77900E+08	3.22192E-02	216
217	1.22910E-02	6.93104E-01	2.78976E+06	6.66456E-02	9.70041E+01	8.40656E+07	3.77900E+08	3.31858E-02	217
218	1.26598E-02	7.05764E-01	2.62030E+06	6.29967E-02	9.70667E+01	7.66587E+07	3.77900E+08	3.41814E-02	218
219	1.30396E-02	7.18804E-01	2.45754E+06	5.87085E-02	9.71254E+01	6.98028E+07	3.77900E+08	3.52068E-02	219
220	1.34308E-02	7.32234E-01	2.30145E+06	5.49997E-02	9.71804E+01	6.34656E+07	3.77900E+08	3.62630E-02	220
221	1.38337E-02	7.46064E-01	2.15201E+06	5.14097E-02	9.72318E+01	5.76160E+07	3.77900E+08	3.73509E-02	221
222	1.42487E-02	7.60317E-01	2.00914E+06	4.79966E-02	9.72798E+01	5.22241E+07	3.77900E+08	3.84715E-02	222
223	1.46761E-02	7.74993E-01	1.87276E+06	4.47388E-02	9.73265E+01	4.72615E+07	3.77900E+08	3.96256E-02	223
224	1.51164E-02	7.90109E-01	1.61915E+06	4.16340E-02	9.73661E+01	4.08144E+07	3.77900E+08	4.08144E-02	224
225	1.55699E-02	8.05679E-01	1.50171E+06	3.68002E-02	9.74048E+01	3.85156E+07	3.77900E+08	4.20388E-02	225
226	1.60370E-02	8.21716E-01	1.39035E+06	3.50745E-02	9.74407E+01	3.46815E+07	3.77900E+08	4.33000E-02	226
227	1.65181E-02	8.38234E-01	1.28495E+06	3.32143E-02	9.74739E+01	3.11745E+07	3.77900E+08	4.45969E-02	227
228	1.70137E-02	8.55248E-01	1.18537E+06	3.06964E-02	9.75206E+01	2.79721E+07	3.77900E+08	4.59369E-02	228
229	1.75241E-02	8.72772E-01	1.09147E+06	2.83176E-02	9.75329E+01	2.50528E+07	3.77900E+08	4.73150E-02	229
230	1.80498E-02	8.90822E-01	1.00307E+06	2.60742E-02	9.75590E+01	2.23962E+07	3.77900E+08	4.87345E-02	230
231	1.85913E-02	9.09413E-01	9.20038E+05	2.39626E-02	9.75830E+01	1.99654E+07	3.77900E+08	5.01965E-02	231
232	1.91450E-02	9.28562E-01	8.42865E+05	2.19789E-02	9.76049E+01	1.77969E+07	3.77900E+08	5.17024E-02	232
233	1.97235E-02	9.48286E-01	8.42186E+05	2.01191E-02	9.76251E+01	1.58147E+07	3.77900E+08	5.32535E-02	233
234	2.03152E-02	9.68601E-01	7.69342E+05	1.83789E-01	9.76434E+01	1.40260E+07	3.77900E+08	5.48511E-02	234
235	2.09247E-02	9.89526E-01	7.01326E+05	1.67541E-01	9.76754E+01	1.09630E+07	3.77900E+08	5.64966E-02	235
236	2.15524E-02	1.01108E+00	6.37953E+05	1.52402E-02	9.76893E+01	6.66055E+06	3.77900E+08	5.81915E-02	236
237	2.21990E-02	1.03328E+00	5.79033E+05	1.38326E-02	9.77018E+01	5.50602E+06	3.77900E+08	5.99373E-02	237
238	2.28650E-02	1.05614E+00	5.24376E+05	1.25269E-02	9.77131E+01	6.52066E+06	3.77900E+08	6.17354E-02	238
239	2.35509E-02	1.07969E+00	4.73786E+05	1.13184E-02	9.77233E+01	6.52066E+06	3.77900E+08	6.35875E-02	239
240	2.42574E-02	1.10395E+00	4.27071E+05	1.02024E-02	9.77325E+01	5.54951E+06	3.77900E+08	6.54951E-02	240
241	2.49852E-02	1.12896E+00	3.84635E+05	9.17428E-03	9.77407E+01	4.74599E+06	3.77900E+08	6.74599E-02	241
242	2.57347E-02	1.15467E+00	3.44856E+05	8.22947E-03	9.77407E+01	3.95779E+06	3.77900E+08	6.94837E-02	242
243	2.65066E-02	1.18114E+00	3.08229E+05	7.36332E-03	9.77481E+01	4.30678E+06	3.77900E+08	7.15602E-02	243
244	2.73020E-02	1.20944E+00	2.75076E+05	5.71316E-03	9.77547E+01	4.73197E+06	3.77900E+08	7.31536E-02	244
245	2.81210E-02	1.23660E+00	4.48966E+05	4.48966E-03	9.77607E+01	7.24655E+06	3.77900E+08	7.49269E-02	245
246	2.89646E-02	1.26556E+00	5.19188E+05	5.19188E-03	9.77657E+01	7.42046E+06	3.77900E+08	7.62046E-02	246
247	2.98336E-02	1.29540E+00	1.92000E+05	4.59580E-03	9.77703E+01	2.38931E+06	3.77900E+08	6.05507E-02	247
248	3.07286E-02	1.32613E+00	1.69088E+05	4.05656E-03	9.77743E+01	1.74889E+06	3.77900E+08	6.29672E-02	248
249	3.16505E-02	1.35777E+00	1.49445E+05	3.57013E-03	9.77779E+01	1.74889E+06	3.77900E+08	6.54562E-02	249
250	3.26000E-02	1.39036E+00	1.31131E+05	3.13260E-03	9.77810E+01	1.44978E+06	3.77900E+08	8.80199E-02	250

J	DX	X	ERGS	CAL	SUM CAL	ERGS/GM	YOZ	ZONE MASS	J
251	3.35780E-02	1.42396E+00	1.14706E+05	2.74023E-03	9.77838E-01	1.26523E+06	3.77900E+08	9.06605E-02	251
252	3.45853E-02	1.45956E+00	1.00022E+05	2.38644E-03	9.77862E-01	1.07113E+06	3.77900E+08	9.33803E-02	252
253	3.56229E-02	1.49416E+00	8.69350E+04	2.07680E-03	9.77883E-01	9.03862E+05	3.77800E+08	9.61817E-02	253
254	3.66916E-02	1.53084E+00	7.53088E+04	1.79906E-03	9.77901E-01	7.60179E+05	3.77900E+08	9.90672E-02	254
255	3.77923E-02	1.54465E+00	6.50143E+04	1.55314E-03	9.77916E-01	6.37150E+05	3.77900E+08	1.02039E-01	255
256	3.89261E-02	1.60757E+00	5.59298E+04	1.33612E-03	9.77929E-01	5.32156E+05	3.77900E+08	1.05100E-01	256
257	4.00938E-02	1.64767E+00	4.79409E+04	1.14527E-03	9.77941E-01	4.42458E+05	3.77900E+08	1.08253E-01	257
258	4.12967E-02	1.68896E+00	4.09404E+04	9.78033E-04	9.77951E-01	3.67176E+05	3.77900E+08	1.11501E-01	258
259	4.25356E-02	1.73150E+00	3.48286E+04	8.32025E-04	9.77959E-01	3.03263E+05	3.77900E+08	1.14846E-01	259
260	4.38116E-02	1.77531E+00	2.95126E+04	7.05031E-04	9.77966E-01	2.49491E+05	3.77900E+08	1.18291E-01	260
261	4.51260E-02	1.82044E+00	2.49068E+04	5.95001E-04	9.77972E-01	2.04422E+05	3.77900E+08	1.21840E-01	261
262	4.64798E-02	1.86692E+00	2.09321E+04	5.00049E-04	9.77977E-01	1.66795E+05	3.77900E+08	1.25495E-01	262
263	4.78742E-02	1.91479E+00	1.75161E+04	4.18444E-04	9.77981E-01	1.35510E+05	3.77900E+08	1.29260E-01	263
264	4.93104E-02	1.96410E+00	1.45926E+04	3.48606E-04	9.77985E-01	1.09605E+05	3.77900E+08	1.33138E-01	264
265	5.07897E-02	2.01489E+00	1.21016E+04	2.89098E-04	9.77988E-01	8.82480E+04	3.77900E+08	1.37132E-01	265
266	5.23134E-02	2.06720E+00	9.98862E+03	2.38620E-04	9.77990E-01	7.07178E+04	3.77900E+08	1.41246E-01	266
267	5.38828E-02	2.12109E+00	8.20450E+03	1.95999E-04	9.77992E-01	5.63947E+04	3.77900E+08	1.45484E-01	267
268	5.54993E-02	2.17459E+00	6.70529E+03	1.60184E-04	9.77993E-01	4.47473E+04	3.77900E+08	1.49848E-01	268
269	5.71642E-02	2.23375E+00	5.45168E+03	1.30236E-04	9.77995E-01	3.53217E+04	3.77900E+08	1.54343E-01	269
270	5.88732E-02	2.29263E+00	4.40877E+03	1.05322E-04	9.77996E-01	2.77327E+04	3.77900E+08	1.58974E-01	270
271	6.06455E-02	2.35328E+00	3.54571E+03	8.47039E-05	9.77997E-01	2.16541E+04	3.77900E+08	1.63743E-01	271
272	6.24649E-02	2.41574E+00	2.83534E+03	6.77340E-05	9.77997E-01	1.66115E+04	3.77900E+08	1.68655E-01	272
273	6.43389E-02	2.48008E+00	2.25345E+03	5.36449E-05	9.77998E-01	1.29750E+04	3.77900E+08	1.73715E-01	273
274	6.62690E-02	2.54635E+00	1.78086E+03	4.25432E-05	9.77998E-01	9.95303E+03	3.77900E+08	1.78926E-01	274
275	6.82571E-02	2.61461E+00	1.39821E+03	3.34021E-05	9.77999E-01	7.56684E+03	3.77900E+08	1.84294E-01	275
276	7.03049E-02	2.64491E+00	1.09063E+03	2.60543E-05	9.77999E-01	5.74552E+03	3.77900E+08	1.89823E-01	276
277	7.24140E-02	2.75732E+00	8.44484E+02	2.01859E-05	9.77999E-01	4.32178E+03	3.77900E+08	1.95510E-01	277
278	7.45864E-02	2.83191E+00	6.50098E+02	1.55303E-05	9.77999E-01	3.22817E+03	3.77900E+08	2.01303E-01	278
279	7.68240E-02	2.90873E+00	4.96550E+02	1.16622E-05	9.77999E-01	2.39388E+03	3.77900E+08	2.07425E-01	279
280	7.92287E-02	2.98786E+00	3.76434E+02	8.99268E-06	9.77999E-01	1.76194E+03	3.77900E+08	2.13647E-01	280
281	8.15025E-02	3.06937E+00	0.	0.	9.77999E-01	0.	3.77900E+08	2.20057E-01	281
282	8.39476E-02	3.15331E+00	0.	0.	9.77999E-01	0.	3.77900E+08	2.26459E-01	282
283	8.64660E-02	3.23976E+00	0.	0.	9.77999E-01	0.	3.77900E+08	2.33468E-01	283
284	8.90600E-02	3.28846E+00	0.	0.	9.77999E-01	0.	3.77900E+08	2.40442E-01	284
285	9.17318E-02	3.42057E+00	0.	0.	9.77999E-01	0.	3.77900E+08	2.47676E-01	285
286	9.44838E-02	3.51505E+00	0.	0.	9.77999E-01	0.	3.77900E+08	2.55106E-01	286
287	9.73183E-02	3.61237E+00	0.	0.	9.77999E-01	0.	3.77900E+08	2.62759E-01	287
288	1.00238E-01	3.71261E+00	0.	0.	9.77999E-01	0.	3.77900E+08	2.70642E-01	288
289	1.03245E-01	3.81586E+00	0.	0.	9.77999E-01	0.	3.77900E+08	2.78761E-01	289
290	1.06342E-01	3.92220E+00	0.	0.	9.77999E-01	0.	3.77900E+08	2.87124E-01	290
291	1.09533E-01	4.03172E+00	0.	0.	9.77999E-01	0.	3.77900E+08	2.95738E-01	291
292	1.12819E-01	4.14455E+00	0.	0.	9.77999E-01	0.	3.77900E+08	3.04610E-01	292
293	1.16203E-01	4.24075E+00	0.	0.	9.77999E-01	0.	3.77900E+08	3.13749E-01	293
294	1.19689E-01	4.38044E+00	0.	0.	9.77999E-01	0.	3.77900E+08	3.23161E-01	294
295	1.23280E-01	4.50372E+00	0.	0.	9.77999E-01	0.	3.77900E+08	3.32856E-01	295

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CYCLE 25   TIME 4.2103E-10   DTNH 5.0000E-11   JTS 2   ETOTAL 6.8281E+00   JFIN 295   JSTAR 243   JSMAX 132   SMAX 5.8422E+09   X(JSMAX) 3.0532E-01
DTPP 2.3496E-12   DTPULS -1.4973E-10   EMVPOS 1.5296E+00   EMVNEG 5.0000E-11   EMVPR 8.8845E-01   EMVPP 1.3727E-02   EMVBH   PDTPOS   PDTNEG
X(1) -5.8028E-07   X(JBND1) 3.0432E-01   X(JBND2) -1.5365E+00   X(JBND3)   X(JFIN) 131   QMAX 1.3355E+07   X(JQMAX) 3.0432E-01   0.   0.

CYCLE 50   TIME 1.6710E-09   DTNH 5.0000E-11   JTS 3   ETOTAL 2.7099E+01   JFIN 295   JSTAR 243   JSMAX 133   SMAX 2.2091E+10   X(JSMAX) 3.0638E-01
DTPP 8.2652E-10   DTPULS 1.5901E-10   EMVPOS 2.4794E+01   EMVNEG -2.4815E+01   EMVPR 1.4768E+01   EMVPP 1.8259E+01   EMVBH   PDTPOS   PDTNEG
X(1) -2.2079E-05   X(JBND1) 3.0432E-01   X(JBND2)   X(JBND3)   X(JFIN) 131   QMAX 2.4467E+08   X(JQMAX) 3.0432E-01   0.   0.

CYCLE 75   TIME 2.9210E-09   DTNH 5.0000E-11   JTS 6   ETOTAL 4.7373E+01   JFIN 295   JSTAR 244   JSMAX 133   SMAX 3.7791E+10   X(JSMAX) 3.0635E-01
DTPP 1.4249E-09   DTPULS 2.1343E-10   EMVPOS 7.2838E-01   EMVNEG -7.2470E+01   EMVPR 4.5782E+01   EMVPP 5.3848E+01   EMVBH   PDTPOS   PDTNEG
X(1) -6.0807E-05   X(JBND1) 3.0432E-01   X(JBND2)   X(JBND3)   X(JFIN) 131   QMAX 8.4615E+08   X(JQMAX) 3.0432E-01   0.   0.

CYCLE 100   TIME 4.1710E-09   DTNH 5.0000E-11   JTS 8   ETOTAL 6.7649E+01   JFIN 295   JSTAR 246   JSMAX 134   SMAX 5.2148E+10   X(JSMAX) 3.0741E-01
DTPP 2.1277E-09   DTPULS 4.1017E-10   EMVPOS 1.4492E+02   EMVNEG -1.4496E+02   EMVPR 8.9566E+01   EMVPP 1.1056E+02   EMVBH   PDTPOS   PDTNEG
X(1) -1.1676E-04   X(JBND1) 3.0431E-01   X(JBND2)   X(JBND3)   X(JFIN) 131   QMAX 1.9575E+09   X(JQMAX) 3.0431E-01   0.   0.

CYCLE 117   TIME 5.0000E-09   DTNH 3.4763E-11   JTS 9   ETOTAL 8.1095E+01   JFIN 295   JSTAR 247   JSMAX 134   SMAX 6.1646E+10   X(JSMAX) 3.0741E-01
DTPP 2.5507E-09   DTPULS 4.4764E-10   EMVPOS 2.0550E+02   EMVNEG -2.0555E+02   EMVPR 2.7596E+01   EMVPP 1.5724E+02   EMVBH   PDTPOS   PDTNEG
X(1) -1.6034E-04   X(JBND1) 3.0429E-01   X(JBND2)   X(JBND3)   X(JFIN) 131   QMAX 3.0274E+09   X(JQMAX) 3.0429E-01   0.   0.

CYCLE 125   TIME 5.5736E-09   DTNH 1.2456E-10   JTS 10   ETOTAL 8.1486E+01   JFIN 295   JSTAR 252   JSMAX 134   SMAX 6.0550E+10   X(JSMAX) 3.0741E-01
DTPP 3.092AE-09   DTPULS 4.9678E-10   EMVPOS 2.4559E+02   EMVNEG -2.4565E+02   EMVPR 3.0080E+01   EMVPP 1.8727E+02   EMVBH   PDTPOS   PDTNEG
X(1) -1.9335E-04   X(JBND1) 3.0428E-01   X(JBND2)   X(JBND3)   X(JFIN) 131   QMAX 3.7625E+09   X(JQMAX) 3.0428E-01   0.   0.

CYCLE 150   TIME 1.2676E-08   DTNH 3.0000E-10   JTS 18   ETOTAL 8.6214E+01   JFIN 295   JSTAR 257   JSMAX 138   SMAX 5.1856E+10   X(JSMAX) 3.1200E-01
DTPP 1.0555E-08   DTPULS 2.0697E-09   EMVPOS 7.2725E+02   EMVNEG -7.2732E+02   EMVPR 1.0733E+02   EMVPP 5.4738E+02   EMVBH   PDTPOS   PDTNEG
X(1) -6.5746E-04   X(JBND1) 3.0409E-01   X(JBND2)   X(JBND3)   X(JFIN) 131   QMAX 6.9418E+09   X(JQMAX) 3.0409E-01   0.   0.

CYCLE 175   TIME 2.0176E-08   DTNH 3.0000E-10   JTS 5   ETOTAL 9.1228E+01   JFIN 285   JSTAR 257   JSMAX 142   SMAX 4.6487E+10   X(JSMAX) 3.1717E-01
DTPP 1.8104E-08   DTPULS 4.1106E-09   EMVPOS 1.1470E+03   EMVNEG -1.1471E+03   EMVPR 6.5049E+02   EMVPP 8.4158E+02   EMVBH   PDTPOS   PDTNEG
X(1) -1.2210E-03   X(JBND1) 3.0389E-01   X(JBND2)   X(JBND3)   X(JFIN) 131   QMAX 3.6589E+09   X(JQMAX) 3.0389E-01   0.   0.

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CYCLE      TIME       DTNH        JTS      ETOTAL        JFIN       JSTAR      JSMAX      SMAX       X(JSMAX)
200     2.7676E-08   3.0000E-10    5      9.6232E-01     295        257         145      4.2424E+10   3.2149E-01
 DTPP     DTPULS      EMVNEG      EMVPOS    EMVPL        EMVPR      EMVPP      EMVBM      PDTPOS      PDTNEG
2.5319E-08 5.8754E-09 -1.4970E-09 1.4969E+03 2.4926E+02 1.0741E+03 8.2487E+02  0.         0.          0.
 X(1)     X(JBND1)    X(JBND2)    X(JBND3)              QMAX       JQMAX      X(JQMAX)
-1.8494E-03 3.0372E-01 0.          0.                  2.8910E+09  130        2.9508E-01

CYCLE      TIME       DTNH        JTS      ETOTAL        JFIN       JSTAR      JSMAX      SMAX       X(JSMAX)
208     3.0000E-08   2.6887E-10    6      9.7783E-01     295        258         146      4.1460E+10   3.2302E-01
 DTPP     DTPULS      EMVNEG      EMVPOS    EMVPL        EMVPR      EMVPP      EMVBM      PDTPOS      PDTNEG
2.7660E-08 6.5670E-09 -1.5955E-09 1.5954E+03 2.7240E+02 8.6704E+02  0.         0.          0.
 X(1)     X(JBND1)    X(JBND2)    X(JBND3)              QMAX       JQMAX      X(JQMAX)
-2.0623E-03 3.0367E-01 0.          0.                  3.0769E+09  130        2.9504E-01

*** SPALL OCCURED AT ZONE  8 LOCATION -3.4578E-05 CM AT CYCLE 223 TIME= 3.7676E-06 SEC   SJ =-5.1382E-09 TSPALL(J)= 5.0000E-09
       TOTAL NO OF FRACTURES IS  1

MOMENTUM AFTER FRACTURE
-1.4217E+02   1.4205E-02

CYCLE      TIME       DTNH        JTS      ETOTAL        JFIN       JSTAR      JSMAX      SMAX       X(JSMAX)
225     3.8850E-08   4.1594E-10    7      9.7774E-01     295        261         150      3.8179E+10   3.2957E-01
 DTPP     DTPULS      EMVNEG      EMVPOS    EMVPL        EMVPR      EMVPP      EMVBM      PDTPOS      PDTNEG
3.5185E-08 9.8319E-09 -1.9146E-09 1.9146E+03 3.7533E+02 9.6783E+02  0.         0.          0.
 X(1)     X(JBND1)    X(JBND2)    X(JBND3)              QMAX       JQMAX      X(JQMAX)
-2.6736E-03 3.0352E-01 0.          0.                  2.6906E+09  130        2.9466E-01

*** SPALL OCCURED AT ZONE 12 LOCATION  1.2639E-03 CM AT CYCLE 228 TIME= 4.0248E-06 SEC   SJ =-5.0757E-09 TSPALL(J)= 5.0000E-09
       TOTAL NO OF FRACTURES IS  2

MOMENTUM AFTER FRACTURE
-1.4217E+02  -8.2493E-01   2.2454E+02

*** SPALL OCCURED AT ZONE 19 LOCATION  3.7244E-03 CM AT CYCLE 240 TIME= 4.6500E-06 SEC   SJ =-5.1631E-09 TSPALL(J)= 5.0000E-09
       TOTAL NO OF FRACTURES IS  3

MOMENTUM AFTER FRACTURE
-1.4217E+02  -8.2493E+01  -1.3968E-02   3.6422E-02

CYCLE      TIME       DTNH        JTS      ETOTAL        JFIN       JSTAR      JSMAX      SMAX       X(JSMAX)
250     5.2099E-08   5.7240E-10    7      9.7777E+01     295        261         154      3.4925E+10   3.3697E-01
 DTPP     DTPULS      EMVNEG      EMVPOS    EMVPL        EMVPR      EMVPP      EMVBM      PDTPOS      PDTNEG
4.5188E-08 1.2769E-08 -2.2851E-09 2.2850E+03 4.4596E+02 1.1322E+03  0.         0.          0.
 X(1)     X(JBND1)    X(JBND2)    X(JBND3)              QMAX       JQMAX      X(JQMAX)
-3.5122E-03 3.0333E-01 0.          0.                  2.5134E+09  129        2.8619E-01

*** SPALL OCCURED AT ZONE 28 LOCATION  7.5957E-03 CM AT CYCLE 258 TIME= 5.6685E-06 SEC   SJ =-5.0017E+09 TSPALL(J)= 5.0000E-09
       TOTAL NO OF FRACTURES IS  4

MOMENTUM AFTER FRACTURE
-1.4217E+02  -8.2493E+01  -1.3968E+02  -1.8616E+02   5.4837E+02
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CYCLE      TIME        JTS    ETOTAL      JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
 275    6.6175E-08      6    9.7771E+01   295     261      158    3.2266E+10  3.4529E-01
 DTPP      DTPULS         EMVNEG  EMVPOS   EMVPL    EMVPR   EMVPP   EMVBM      PDTPOS  PDTNEG
5.4866E-08 1.6303E-08  -2.5847E+03 2.5846E+03 5.2594E+02 1.2441E+03 1.7700E+03  0.      0.
 X(1)     DTNH  X(JBND1)  X(JBND2)  X(JBND3)  X(JFIN)  JQMAX   JOMAX   QMAX      X(JQMAX)
-4.3862E-01 5.7839E-10 3.0316E-01  0.      0.      4.5037E+00  128  2.0087E+09  2.7776E-01

CYCLE      TIME        JTS    ETOTAL      JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
 300    8.0328E-08      6    9.7776E+01   295     261      162    3.0206E+10  3.5662E-01
 DTPP      DTPULS         EMVNEG  EMVPOS   EMVPL    EMVPR   EMVPP   EMVBM      PDTPOS  PDTNEG
6.3493E-08 2.0902E-08  -2.8149E+03 2.8147E+03 6.3221E+02 1.2882E+03 1.9204E+03  0.      0.
 X(1)     DTNH  X(JBND1)  X(JBND2)  X(JBND3)  X(JFIN)  JQMAX   JOMAX   QMAX      X(JQMAX)
-5.2607E-03 5.823AE-10 3.030AE-01  0.      0.      4.5037E+00  128  1.6656E+09  2.7750E-01

CYCLE      TIME        JTS    ETOTAL      JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
 325    9.4523E-08      6    9.7779E+01   295     262      165    2.8662E+10  3.6240E-01
 DTPP      DTPULS         EMVNEG  EMVPOS   EMVPL    EMVPR   EMVPP   EMVBM      PDTPOS  PDTNEG
7.1106E-08 2.3635E-08  -3.0020E+03 3.0018E+03 6.7697E+02 1.3597E+03 2.0366E+03  0.      0.
 X(1)     DTNH  X(JBND1)  X(JBND2)  X(JBND3)  X(JFIN)  JQMAX   JOMAX   QMAX      X(JQMAX)
-6.1415E-03 5.8300E-10 3.0288E-01  0.      0.      4.5037E+00  127  1.8589E+09  2.6930E-01

=== SPALL OCCURED AT ZONE  51 LOCATION  2.2871E-02 CM AT CYCLE 347 TIME= 1.0702E-07 SEC   SJ =-5.0110E+09 TSPALL(J)= 5.0000E+09
    TOTAL NO OF FRACTURES IS  5

MOMENTUM AFTER FRACTURE
-1.4217E+02  -8.2493E-01   -1.3968E+02  -8.2471E-02  -1.8416E-02  -4.6368E+02   1.0120E+03

CYCLE      TIME        JTS    ETOTAL      JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
 350    1.0876E-07      6    9.7767E+01   295     262      168    2.7296E+10  3.7087E-01
 DTPP      DTPULS         EMVNEG  EMVPOS   EMVPL    EMVPR   EMVPP   EMVBM      PDTPOS  PDTNEG
7.8041E-08 2.7084E-08  -3.1518E+03 3.1516E+03 7.3928E+02 1.3909E+03 2.1302E+03  0.      0.
 X(1)     DTNH  X(JBND1)  X(JBND2)  X(JBND3)  X(JFIN)  JQMAX   JOMAX   QMAX      X(JQMAX)
-7.0259E-03 5.8079E-10 3.0277E-01  0.      0.      4.5037E+00  126  1.8306E+09  2.6133E-01

CYCLE      TIME        JTS    ETOTAL      JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
 375    1.2303E-07      6    9.7777E+01   295     262      171    2.6178E+10  3.8011E-01
 DTPP      DTPULS         EMVNEG  EMVPOS   EMVPL    EMVPR   EMVPP   EMVBM      PDTPOS  PDTNEG
8.4188E-08 3.1266E-08  -3.2775E+03 3.2773E+03 8.1848E+02 1.3854E+03 2.2039E+03  0.      0.
 X(1)     DTNH  X(JBND1)  X(JBND2)  X(JBND3)  X(JFIN)  JQMAX   JOMAX   QMAX      X(JQMAX)
-7.9123E-03 5.7922E-10 3.0267E-01  0.      0.      4.5037E+00  125  1.6601E+09  2.5358E-01

CYCLE      TIME        JTS    ETOTAL      JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
 400    1.3733E-07      6    9.7774E+01   295     262      174    2.4867E+10  3.9017E-01
 DTPP      DTPULS         EMVNEG  EMVPOS   EMVPL    EMVPR   EMVPP   EMVBM      PDTPOS  PDTNEG
9.1148E-08 3.6945E-08  -3.3802E+03 3.3800E+03 9.1872E+02 1.3479E+03 2.2666E+03  0.      0.
 X(1)     DTNH  X(JBND1)  X(JBND2)  X(JBND3)  X(JFIN)  JQMAX   JOMAX   QMAX      X(JQMAX)
-8.8005E-03 5.7831E-10 3.0259E-01  0.      0.      4.5037E+00  124  1.4820E+09  2.4605E-01

CYCLE      TIME        JTS    ETOTAL      JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
 425    1.5165E-07      6    9.7780E+01   295     263      176    2.4272E+10  3.9744E-01
 DTPP      DTPULS         EMVNEG  EMVPOS   EMVPL    EMVPR   EMVPP   EMVBM      PDTPOS  PDTNEG
9.5276E-08 3.8211E-08  -3.4656E+03 3.4656E+03 9.2747E+02 1.3863E+03 2.3138E+03  0.      0.
 X(1)     DTNH  X(JBND1)  X(JBND2)  X(JBND3)  X(JFIN)  JQMAX   JOMAX   QMAX      X(JQMAX)
-9.6903E-03 5.7747E-10 3.0251E-01  0.      0.      4.5037E+00  123  1.2827E+09  2.3473E-01
```

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CYCLE 450
```
TIME     1.6599E-07   DTNH   5.7472E-10   JTS      6   ETOTAL  9.7779E+01   JFIN 295   JSTAR 263   JSMAX 178   SMAX 2.3523E+10   X(JSMAX) 4.0514E-01
DTPP     1.0037E-07   DTPULS 4.0582E-08   EMVPOS 3.5347E+03   EMVPL 9.5458E+02   EMVPR 1.4063E+03   EMVPP 2.3609E+03   EMVBM      PDTPOS 0.   PDTNEG 0.
         DTPULS       EMVNEG -3.5349E+03
X(1)                  X(JRND1)            X(JRND3)            X(JFIN)            JQMAX 123   QMAX 1.3323E+09   X(JQMAX) 2.3854E-01
-1.0581E-02           3.0244E-01          0.
```

CYCLE 475
```
TIME     1.8032E-07   DTNH   5.7616E-10   JTS      6   ETOTAL  9.7781E+01   JFIN 295   JSTAR 263   JSMAX 180   SMAX 2.2791E+10   X(JSMAX) 4.1330E-01
DTPP     1.0520E-07   DTPULS 4.3413E-08   EMVPOS 3.5888E+03   EMVPL 9.8942E+02   EMVPR 1.4082E+03   EMVPP 2.3976E+03   EMVBM      PDTPOS 0.   PDTNEG 0.
         DTPULS       EMVNEG -3.5890E+03
X(1)                  X(JRND1)            X(JRND3)            X(JFIN)            JQMAX 122   QMAX 1.3675E+09   X(JQMAX) 2.3145E-01
-1.1473E-02           3.0239E-01          0.
```

CYCLE 500
```
TIME     1.9467E-07   DTNH   5.7577E-10   JTS      6   ETOTAL  9.7779E+01   JFIN 295   JSTAR 263   JSMAX 182   SMAX 2.2155E+10   X(JSMAX) 4.2193E-01
DTPP     1.0955E-07   DTPULS 4.6664E-08   EMVPOS 3.6359E+03   EMVPL 1.0337E+03   EMVPR 1.3930E+03   EMVPP 2.4267E+03   EMVBM      PDTPOS 0.   PDTNEG 0.
         DTPULS       EMVNEG -3.6361E+03
X(1)                  X(JRND1)            X(JRND3)            X(JFIN)            JQMAX 121   QMAX 1.3618E+09   X(JQMAX) 2.2455E-01
-1.2366E-02           3.0233E-01          0.
```

CYCLE 525
```
TIME     2.0904E-07   DTNH   5.7551E-10   JTS      6   ETOTAL  9.7780E+01   JFIN 295   JSTAR 263   JSMAX 184   SMAX 2.1540E+10   X(JSMAX) 4.3107E-01
DTPP     1.1363E-07   DTPULS 5.0400E-08   EMVPOS 3.6725E+03   EMVPL 1.0856E+03   EMVPR 1.3621E+03   EMVPP 2.4477E+03   EMVBM      PDTPOS 0.   PDTNEG 0.
         DTPULS       EMVNEG -3.6727E+03
X(1)                  X(JRND1)            X(JRND3)            X(JFIN)            JQMAX 120   QMAX 1.3335E+09   X(JQMAX) 2.1785E-01
-1.3260E-02           3.0229E-01          0.
```

REZOME AT CYCLE 525 ADDED 53 ZONES DELETED 40 ZONES   NEW JSTAR IS 276

CYCLE 550
```
TIME     2.2358E-07   DTNH   5.8494E-10   JTS      5   ETOTAL  9.7781E+01   JFIN 308   JSTAR 277   JSMAX 147   SMAX 2.1011E+10   X(JSMAX) 4.3046E-01
DTPP     1.1764E-07   DTPULS 4.0045E-08   EMVPOS 3.6903E+03   EMVPL 8.4138E+02   EMVPR 1.6313E+03   EMVPP 2.4727E+03   EMVBM      PDTPOS 0.   PDTNEG 0.
         DTPULS       EMVNEG -3.6915E+03
X(1)                  X(JRND1)            X(JRND3)            X(JFIN)            JQMAX  85   QMAX 1.2931E+09   X(JQMAX) 2.1134E-01
-1.4148E-02           3.0225E-01          0.
```

CYCLE 575
```
TIME     2.3824E-07   DTNH   5.8791E-10   JTS      5   ETOTAL  9.7783E+01   JFIN 308   JSTAR 277   JSMAX 156   SMAX 2.0582E+10   X(JSMAX) 4.4592E-01
DTPP     1.2137E-07   DTPULS 4.1060E-08   EMVPOS 3.7071E+03   EMVPL 8.4430E+02   EMVPR 1.6513E+03   EMVPP 2.4956E+03   EMVBM      PDTPOS 0.   PDTNEG 0.
         DTPULS       EMVNEG -3.7083E+03
X(1)                  X(JRND1)            X(JRND3)            X(JFIN)            JQMAX  84   QMAX 1.2494E+09   X(JQMAX) 2.0502E-01
-1.5059E-02           3.0221E-01          0.
```

CYCLE 600
```
TIME     2.5291E-07   DTNH   5.8762E-10   JTS      5   ETOTAL  9.7767E+01   JFIN 308   JSTAR 277   JSMAX 154   SMAX 2.0204E+10   X(JSMAX) 4.5648E-01
DTPP     1.2391E-07   DTPULS 4.6042E-08   EMVPOS 3.7272E+03   EMVPL 9.3025E+02   EMVPR 1.5732E+03   EMVPP 2.5035E+03   EMVBM      PDTPOS 0.   PDTNEG 0.
         DTPULS       EMVNEG -3.7284E+03
X(1)                  X(JRND1)            X(JRND3)            X(JFIN)            JQMAX  83   QMAX 1.2030E+09   X(JQMAX) 1.9889E-01
-1.5972E-02           3.0218E-01          0.
```

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```
CYCLE     TIME       DTNH        JTS    ETOTAL      JFIN    JSTAR    JSMAX      SMAX       X(JSMAX)
 625    2.6759E-07  5.4750E-10    5   9.7790E+01    308     277      157     1.9837E+10   4.6489E-01
        DTPP        DTPULS      EMVPOS   EMVPL     EMVPR    EMVPP    EMVBM     PDTPOS      PDTNEG
1.2682E-07  4.6693E-08 -3.72A0E+03  3.726AE+03  9.3021E+02  1.5855E+03  2.5157E+03   0.        0.
 X(I)     X(JRND1)    X(JRND3)   X(JFIN)   QMAX    QMAX    X(JQMAX)
-1.6896E-02  3.0215E-01    0.      4.5037E+00   82   1.1484E+09  1.9293E-01

REZONE AT CYCLE 625 ADDED 0 ZONES DELETED 26 ZONES NEW JSTAR IS 251

CYCLE     TIME       DTNH        JTS    ETOTAL      JFIN    JSTAR    JSMAX      SMAX       X(JSMAX)
 650    2.8624E-07  7.5A23E-10    7   9.7793E+01    282     252      135     1.9396E+10   4.7515E-01
        DTPP        DTPULS      EMVPOS   EMVPL     EMVPR    EMVPP    EMVBM     PDTPOS      PDTNEG
1.3017E-07  4.133AE-08 -3.7082E+03  3.7030E+03  8.0181E+02  1.7231E+03  2.5249E+03   0.        0.
 X(I)     X(JRND1)    X(JRND3)   X(JFIN)   QMAX    QMAX    X(JQMAX)
-1.8042E-02  3.0211E-01    0.      4.5037E+00   49   1.0410E+09  1.3A06E-01

CYCLE     TIME       DTNH        JTS    ETOTAL      JFIN    JSTAR    JSMAX      SMAX       X(JSMAX)
 675    3.0522E-07  7.5985E-10    7   9.7788E+01    282     252      142     1.9086E+10   4.8593E-01
        DTPP        DTPULS      EMVPOS   EMVPL     EMVPR    EMVPP    EMVBM     PDTPOS      PDTNEG
1.3274E-07  4.2957E-08 -3.6875E+03  3.6824E+03  8.1988E+02  1.7137E+03  2.5335E+03   0.        0.
 X(I)     X(JRND1)    X(JRND3)   X(JFIN)   QMAX    QMAX    X(JQMAX)
-1.9236E-02  3.0209E-01    0.      4.5037E+00   57   1.0890E+09  1.7614E-01

CYCLE     TIME       DTNH        JTS    ETOTAL      JFIN    JSTAR    JSMAX      SMAX       X(JSMAX)
 700    3.2421E-07  7.5993E-10    7   9.7788E+01    282     252      149     1.8734E+10   4.9731E-01
        DTPP        DTPULS      EMVPOS   EMVPL     EMVPR    EMVPP    EMVBM     PDTPOS      PDTNEG
1.3561E-07  4.5702E-08 -3.6315E+03  3.6209E+03  8.5617E+02  1.6843E+03  2.5405E+03   0.        0.
 X(I)     X(JRND1)    X(JRND3)   X(JFIN)   QMAX    QMAX    X(JQMAX)
-2.0206E-02  3.0206E-01    0.      4.5037E+00   53   1.2239E+09  1.5615E-01

REZONE AT CYCLE 700 ADDED 24 ZONES DELETED 0 ZONES NEW JSTAR IS 276

CYCLE     TIME       DTNH        JTS    ETOTAL      JFIN    JSTAR    JSMAX      SMAX       X(JSMAX)
 725    3.4320E-07  7.5991E-10    7   9.7790E+01    306     276      156     1.8376E+10   5.0926E-01
        DTPP        DTPULS      EMVPOS   EMVPL     EMVPR    EMVPP    EMVBM     PDTPOS      PDTNEG
1.3841E-07  4.9366E-08 -3.4370E+03  3.4319E+03  9.0679E+02  1.6366E+03  2.5434E+03   0.        0.
 X(I)     X(JRND1)    X(JRND3)   X(JFIN)   QMAX    QMAX    X(JQMAX)
-2.1628E-02  3.0204E-01    0.      4.5037E+00   54   1.5604E+09  1.6092E-01

REZONE AT CYCLE 725 ADDED 0 ZONES DELETED 22 ZONES NEW JSTAR IS 254

CYCLE     TIME       DTNH        JTS    ETOTAL      JFIN    JSTAR    JSMAX      SMAX       X(JSMAX)
 750    3.6212E-07  7.5985E-10    5   9.7784E+01    284     254      41      1.9598E+10   1.6095E-01
        DTPP        DTPULS      EMVPOS   EMVPL     EMVPR    EMVPP    EMVBM     PDTPOS      PDTNEG
9.8881E-08  3.1151E-08 -3.1680E+03  3.157AE+03  6.1051E+02  1.3274E+03  1.9379E+03   0.        0.
 X(I)     X(JRND1)    X(JRND3)   X(JFIN)   QMAX    QMAX    X(JQMAX)
-2.2889E-02  3.0203E-01    0.      4.5037E+00    2   6.0145E+08 -1.7545E-02

CYCLE     TIME       DTNH        JTS    ETOTAL      JFIN    JSTAR    JSMAX      SMAX       X(JSMAX)
 775    3.8110E-07  7.5958E-10    5   9.7790E+01    284     255      40      1.8035E+10   1.5642E-01
        DTPP        DTPULS      EMVPOS   EMVPL     EMVPR    EMVPP    EMVBM     PDTPOS      PDTNEG
9.6967E-08  8.0986E-09 -2.9837E+03  2.9726E+03  1.4606E+02  1.6028E+03  1.74A8E+03   0.        0.
 X(I)     X(JRND1)    X(JRND3)   X(JFIN)   QMAX    QMAX    X(JQMAX)
-2.413AE-02  3.0201E-01    0.      4.5037E+00   46   6.5996E+08  1.8644E-01
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CYCLE        TIME        DTNH         JTS      ETOTAL       JFIN      JSTAR      JSMAX       SMAX      X(JSMAX)
 800      4.0010E-07   7.5940E-10     5      9.7792E+01     284        255        152      1.7156E+10   5.4297E-01
          DTPP         DTPULS       EMVPOS     EMVPL      EMVPR      EMVPP               EMVBM      PDTPOS      PDTNEG
          5.7491E-08  -2.9442E+03   2.9351E+03 9.8976E+02 1.5595E+03              0.                 0.          0.
 1.4850E-07  X(1)       X(JBND1)    X(JBND3)   X(JFIN)              X(JQMAX)              X(JQMAX)
            5.7491E-08  3.0200E-01   0.         4.5037E+00 5.3385E+00 47         1.9208E-01
-2.5390E-02  3.0200E-01  0.

REZONE AT CYCLE 800   ADDED 18 ZONES  DELETED 0 ZONES   NEW JSTAR IS 273

CYCLE        TIME        DTNH         JTS      ETOTAL       JFIN      JSTAR      JSMAX       SMAX      X(JSMAX)
 825      4.1909E-07   7.5985E-10     5      9.7792E+01     302        273        158      1.6685E+10   5.5525E-01
          DTPP         DTPULS       EMVPOS     EMVPL      EMVPR      EMVPP               EMVBM      PDTPOS      PDTNEG
          6.2572E-08  -3.0239E+03   3.0128E+03 1.0446E+03 1.5053E+03              0.                 0.          0.
 1.5279E-07  X(1)       X(JBND1)    X(JBND3)   X(JFIN)              X(JQMAX)              X(JQMAX)
            X(JBND1)    3.0200E-01   0.         4.5037E+00 7.2826E+00 49         2.0393E-01
-2.6646E-02  3.0200E-01  0.

REZONE AT CYCLE 825   ADDED 0 ZONES  DELETED 29 ZONES   NEW JSTAR IS 244

CYCLE        TIME        DTNH         JTS      ETOTAL       JFIN      JSTAR      JSMAX       SMAX      X(JSMAX)
 850      4.4368E-07   9.7584E-10     6      9.7763E+01     273        245        135      1.6232E+10   5.6808E-01
          DTPP         DTPULS       EMVPOS     EMVPL      EMVPR      EMVPP               EMVBM      PDTPOS      PDTNEG
          6.4175E-08  -3.1851E+03   3.1680E+03 1.0417E+03 1.5075E+03              0.                 0.          0.
 1.5705E-07  X(1)       X(JBND1)    X(JBND3)   X(JFIN)              X(JQMAX)              X(JQMAX)
            X(JBND1)    3.0199E-01   0.         4.5037E+00 1.6005E-09  4        -1.0411E-02
-2.8234E-02  3.0199E-01  0.

CYCLE        TIME        DTNH         JTS      ETOTAL       JFIN      JSTAR      JSMAX       SMAX      X(JSMAX)
 875      4.6746E-07   9.7598E-10     6      9.7773E+01     273        245        142      1.5742E+10   5.8379E-01
          DTPP         DTPULS       EMVPOS     EMVPL      EMVPR      EMVPP               EMVBM      PDTPOS      PDTNEG
          7.0077E-08  -3.3448E+03   3.3277E+03 1.1032E+03 1.4425E+03              0.                 0.          0.
 1.6171E-07  X(1)       X(JBND1)    X(JBND3)   X(JFIN)              X(JQMAX)              X(JQMAX)
            X(JBND1)    3.0199E-01   0.         4.5037E+00 1.0754E+09  24         1.1202E-01
-2.9844E-02  3.0199E-01  0.

CYCLE        TIME        DTNH         JTS      ETOTAL       JFIN      JSTAR      JSMAX       SMAX      X(JSMAX)
 900      4.9185E-07   9.7569E-10     6      9.7781E+01     273        245        147      1.5374E+10   5.9554E-01
          DTPP         DTPULS       EMVPOS     EMVPL      EMVPR      EMVPP               EMVBM      PDTPOS      PDTNEG
          6.9226E-08  -3.4774E+03   3.4605E+03 1.0643E+03 1.4778E+03              0.                 0.          0.
 1.6535E-07  X(1)       X(JBND1)    X(JBND3)   X(JFIN)              X(JQMAX)              X(JQMAX)
            X(JBND1)    3.0199E-01   0.         4.5037E+00 8.1060E+08  48         2.3715E-01
-3.1463E-02  3.0199E-01  0.

CYCLE        TIME        DTNH         JTS      ETOTAL       JFIN      JSTAR      JSMAX       SMAX      X(JSMAX)
 909      5.0900E-07   4.1853E-10     6      9.7783E+01     273        245        149      1.5298E+10   6.0039E-01
          DTPP         DTPULS       EMVPOS     EMVPL      EMVPR      EMVPP               EMVBM      PDTPOS      PDTNEG
          6.9931E-08  -3.5175E+03   3.5004E+03 1.0698E+03 1.4710E+03              0.                 0.          0.
 1.6609E-07  X(1)       X(JBND1)    X(JBND3)   X(JFIN)              X(JQMAX)              X(JQMAX)
            X(JBND1)    3.0199E-01   0.         4.5037E+00 7.6064E+08  49         2.4440E-01
-3.2003E-02  3.0199E-01  0.

CYCLE        TIME        DTNH         JTS      ETOTAL       JFIN      JSTAR      JSMAX       SMAX      X(JSMAX)
 925      5.1385E-07   9.7555E-10     6      9.7783E+01     273        245        153      1.5081E+10   6.1020E-01
          DTPP         DTPULS       EMVPOS     EMVPL      EMVPR      EMVPP               EMVBM      PDTPOS      PDTNEG
          7.4866E-08  -3.5767E+03   3.5596E+03 1.1291E+03 1.4096E+03              0.                 0.          0.
 1.6833E-07  X(1)       X(JBND1)    X(JBND3)   X(JFIN)              X(JQMAX)              X(JQMAX)
            X(JBND1)    3.0200E-01   0.         4.5037E+00 7.7491E+08  49         2.4448E-01
-3.2919E-02  3.0200E-01  0.

REZONE AT CYCLE 925   ADDED 23 ZONES  DELETED 29 ZONES   NEW JSTAR IS 239
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CYCLE 950
TIME 5.5851E-07   DTNH 1.8979E-09   JTS 8   ETOTAL 9.7759E+01   JFIN 267   JSTAR 240   JSMAX 133   SMAX 1.4661E+10   X(JSMAX) 6.3348E-01
nTPP   DTPULS 7.6573E-09   EMVNEG -3.7497E+03   EMVPOS 3.7155E+03   EMVPL 1.1103E+03   EMVPR 1.4201E+03   EMVPP 2.5303E+03   EMVBM   PDTPOS 0.   PDTNEG 0.
X(1)   X(JANO1)   X(JBND3) 0.   X(JFIN)   JQMAX 42   QMAX 8.7888E+03   X(JQMAX) 0.
1.7259E-07   -3.5876E-02   3.0202E-01   4.5037E+00   2.6771E-01

CYCLE 975
TIME 6.0592E-07   DTNH 1.8945E-09   JTS 8   ETOTAL 9.7769E+01   JFIN 267   JSTAR 241   JSMAX 143   SMAX 1.4213E+10   X(JSMAX) 6.6118E-01
nTPP   DTPULS 8.0827E-09   EMVNEG -3.8575E+03   EMVPOS 3.8233E+03   EMVPL 1.1488E+03   EMVPR 1.3686E+03   EMVPP 2.5174E+03   EMVBM   PDTPOS 0.   PDTNEG 0.
X(1)   X(JANO1)   X(JBND3) 0.   X(JFIN)   JQMAX 45   QMAX 7.9059E+08   X(JQMAX) 0.
1.7711E-07   -3.9014E-02   3.0706E-01   4.5037E+00   2.9311E-01

CYCLE 1000
TIME 6.5334E-07   DTNH 1.8989E-09   JTS 8   ETOTAL 9.7777E+01   JFIN 267   JSTAR 241   JSMAX 152   SMAX 1.3769E+10   X(JSMAX) 6.8794E-01
nTPP   DTPULS 8.4458E-09   EMVNEG -3.9364E+03   EMVPOS 3.9021E+03   EMVPL 1.1657E+03   EMVPR 1.3390E+03   EMVPP 2.5047E+03   EMVBM   PDTPOS 0.   PDTNEG 0.
X(1)   X(JANO1)   X(JBND3) 0.   X(JFIN)   JQMAX 46   QMAX 9.0112E+08   X(JQMAX) 0.
1.8196E-07   -4.2156E-02   3.0221E-01   4.5037E+00   3.0221E-01

REZONE AT CYCLE 1000   ADDED 24 ZONES   DELETED 0 ZONES   NEW JSTAR IS 265

CYCLE 1025
TIME 7.0079E-07   DTNH 1.8984E-09   JTS 8   ETOTAL 9.7774E+01   JFIN 291   JSTAR 266   JSMAX 160   SMAX 1.3365E+10   X(JSMAX) 7.1329E-01
nTPP   DTPULS 8.6255E-08   EMVNEG -4.0063E+03   EMVPOS 3.9721E+03   EMVPL 1.1528E+03   EMVF   EMVPP 2.4805E+03   EMVBM   PDTPOS 0.   PDTNEG 0.
X(1)   X(JANO1)   X(JBND3) 0.   X(JFIN)   JQMAX 11   QMAX 2.4919E-03   X(JQMAX) 0.
1.8646E-07   -4.5295E-02   1.3390E+03   4.5037E+00   3.3253E-08   3.8632E-02

REZONE AT CYCLE 1025   ADDED 0 ZONES   DELETED 22 ZONES   NEW JSTAR IS 244

CYCLE 1050
TIME 7.4894E-07   DTNH 1.9319E-09   JTS 8   ETOTAL 9.7784E+01   JFIN 269   JSTAR 245   JSMAX 146   SMAX 1.2877E+10   X(JSMAX) 7.4015E-01
nTPP   DTPULS 9.0515E-08   EMVNEG -4.1061E+03   EMVPOS 4.0426E+03   EMVPL 1.1656E+03   EMVPR 1.3150E+03   EMVPP 2.4805E+03   EMVBM   PDTPOS 0.   PDTNEG 0.
X(1)   X(JANO1)   X(JBND3) 0.   X(JFIN)   JQMAX 58   QMAX 4.0619E+08   X(JQMAX) 0.
1.9267E-07   -4.8687E-02   3.0284E-01   4.5037E+00   3.6761E-01

CYCLE 1075
TIME 7.9773E-07   DTNH 1.9526E-09   JTS 8   ETOTAL 9.7794E+01   JFIN 269   JSTAR 245   JSMAX 154   SMAX 1.2427E+10   X(JSMAX) 7.6863E-01
nTPP   DTPULS 9.6414E-08   EMVNEG -4.3366E+03   EMVPOS 4.2732E+03   EMVPL 1.1981E+03   EMVPR 1.2675E+03   EMVPP 2.4657E+03   EMVBM   PDTPOS 0.   PDTNEG 0.
X(1)   X(JANO1)   X(JBND3) 0.   X(JFIN)   JQMAX 6   QMAX 3.1720E+08   X(JQMAX) 0.
1.9841E-07   -5.1713E-02   3.0307E-01   4.5037E+00   2.4540E-03

CYCLE 1100
TIME 8.4658E-07   DTNH 1.9540E-09   JTS 8   ETOTAL 9.7788E+01   JFIN 269   JSTAR 246   JSMAX   SMAX 1.1974E+10   X(JSMAX) 7.9496E-01
nTPP   DTPULS 9.9273E-08   EMVNEG -4.5134E+03   EMVPOS 4.4501E+03   EMVPL 1.1887E+03   EMVPR 1.2624E+03   EMVPP 2.4511E+03   EMVBM   PDTPOS 0.   PDTNEG 0.
X(1)   X(JANO1)   X(JBND3) 0.   X(JFIN)   JQMAX 70   QMAX 2.8040E+08   X(JQMAX) 0.
2.0476E-07   -5.4947E-02   3.0325E-01   4.5037E+00   4.1761E-01

REZONE AT CYCLE 1100   ADDED 25 ZONES   DELETED 0 ZONES   NEW JSTAR IS 271

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CYCLE        TIME        DTNH         JTS       ETOTAL        JFIN       JSTAR       JSMAX      X(JSMAX)
1125      8.9565E-07   1.9554E-07      8       9.7791E-01     294         271          168       8.2269E-01
DTPP       DTPULS      EMVNEG       EMVPOS       EMVPL        EMVPR       EMVPP        EMVBM       PDTNEG
2.1029E-07 1.0607E-07 -4.4352E-03  4.571RE-03  1.2065E-03   1.2315E+03  5.4380E+03    168       0.
X(1)       X(JBMD1)    X(JBMD2)    X(JBMD3)     X(JFIN)      JQMAX       QMAX       X(JQMAX)
-5.0182E-02 3.0339E-01   0.          0.          4.5037E+00    76        3.1408E+08   4.4607E-01    0.

REZONE AT CYCLE 1125  ADDED  0 ZONES  DELETED 13 ZONES   NEW JSTAR IS 256

CYCLE        TIME        DTNH         JTS       ETOTAL        JFIN       JSTAR       JSMAX      X(JSMAX)
1150      9.4432E-07   1.9544E-09      8       9.7781E-01     281         258          162       2.3193E-01
DTPP       DTPULS      EMVNEG       EMVPOS       EMVPL        EMVPR       EMVPP        EMVBM       PDTNEG
2.1642E-07 1.1125E-07 -4.7695E-03  6.6461E-03  1.2459E+03   1.1778E+03  2.4236E+03    162       0.
X(1)       X(JBMD1)    X(JBMD2)    X(JBMD3)     X(JFIN)      JQMAX       QMAX       X(JQMAX)
-6.1417E-02 3.0349E-01   0.          0.          4.5037E+00    69        3.3583E+08   4.7392E-01    0.

CYCLE        TIME        DTNH         JTS       ETOTAL        JFIN       JSTAR       JSMAX      X(JSMAX)
1175      9.9318E-07   1.9550E-09      8       9.7703E-01     281         259          168       8.7822E-01
DTPP       DTPULS      EMVNEG       EMVPOS       EMVPL        EMVPR       EMVPP        EMVBM       PDTNEG
2.2209E-07 1.1329E-07 -4.7523E-03  4.6806E+03  1.2357E+03   1.1747E+03  2.4104E+03    168       0.
X(1)       X(JBMD1)    X(JBMD2)    X(JBMD3)     X(JFIN)      JQMAX       QMAX       X(JQMAX)
-6.4652E-02 3.0356E-01   0.          0.          4.5037E+00   172        2.1159E+08   8.9619E-01    0.

CYCLE        TIME        DTNH         JTS       ETOTAL        JFIN       JSTAR       JSMAX      X(JSMAX)
1178      1.0000E-06   1.1423E-09      8       9.7764E-01     281         259          169       8.0273E-01
DTPP       DTPULS      EMVNEG       EMVPOS       EMVPL        EMVPR       EMVPP        EMVBM       PDTNEG
2.2228E-07 1.1779E-07 -4.7557E-03  4.6923E+03  1.2438E+03   1.1647E+03  2.4085E+03    169       0.
X(1)       X(JBMD1)    X(JBMD2)    X(JBMD3)     X(JFIN)      JQMAX       QMAX       X(JQMAX)
-6.5103E-02 3.0357E-01   0.          0.          4.5037E+00   173        2.0888E+08   9.0083E-01    0.

CYCLE        TIME        DTNH         JTS       ETOTAL        JFIN       JSTAR       JSMAX      X(JSMAX)
1200      1.0393E-06   1.9544E-09      8       9.7703E-01     281         259          173       9.0109E-01
DTPP       DTPULS      EMVNEG       EMVPOS       EMVPL        EMVPR       EMVPP        EMVBM       PDTNEG
2.2707E-07 1.0768E-07 -4.7604E-03  4.6972E+03  1.1374E+03   1.2612E+03  2.3986E+03    173       0.
X(1)       X(JBMD1)    X(JBMD2)    X(JBMD3)     X(JFIN)      JQMAX       QMAX       X(JQMAX)
-6.7708E-02 3.0361E-01   0.          0.          4.5037E+00    82        1.9134E+08   5.2418E-01    0.

REZONE AT CYCLE 1200  ADDED 23 ZONES  DELETED  0 ZONES   NEW JSTAR IS 282

*** SPALL OCCURED AT ZONE 32 LOCATION 3.0362E-01 CM AT CYCLE1207 TIME= 1.0530E-06 SEC   SJ =-4.6189E+07 TSPALL(J)=-0.
    TOTAL NO OF FRACTURES IS 4

MOMENTUM AFTER FRACTURE
-1.5117E-02 -8.2896E-01 -1.6750E-02 -2.0034E-02 -4.9097E-02 -3.5677E-03  4.5771E-03

CYCLE        TIME        DTNH         JTS       ETOTAL        JFIN       JSTAR       JSMAX      X(JSMAX)
1225      1.0432E-06   1.9544E-09      8       9.7778E-01     304         263          183       9.2951E-01
DTPP       DTPULS      EMVNEG       EMVPOS       EMVPL        EMVPR       EMVPP        EMVBM       PDTNEG
2.2889E-07 1.0358E-07 -4.7475E-03  4.6861E+03  1.0823E+03   1.3023E+03  2.3846E+03    183       0.
X(1)       X(JBMD1)    X(JBMD2)    X(JBMD3)     X(JFIN)      JQMAX       QMAX       X(JQMAX)
-7.0943E-02 3.0364E-01   0.          0.          4.5037E+00    12        2.4637E+08   6.3825E-02    0.

REZONE AT CYCLE 1225  ADDED  0 ZONES  DELETED 13 ZONES   NEW JSTAR IS 270
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CYCLE 1250
TIME 1.1371E-06 DTNH 1.9537E-09 ETOTAL 9.7776E+01 JTS 6 JFIN 291 JSTAR 270 JSMAX 181 SMAX 1.0161E-10 X(JSMAX) 9.5935E-01
DTPP 2.3319E-07 OTPULS -4.733RE+03 EMVNEG EMVPOS 4.6704E+03 EMVPR 1.1046E+03 EMVPP EMVPP PDTPOS 0. PDTNEG
X(1) 1.2469E-07 X(JBND1) X(JBND3) X(JFIN) JQMAX 184 JSTAR 270
-7.6179E-02 3.0167E-01 0. 4.5037E+00 2.1576E+06 9.7456E-01 X(JQMAX) 0.

CYCLE 1275
TIME 1.1959E-06 DTNH 1.9544E-09 ETOTAL 9.7761E+01 JTS 8 JFIN 291 JSTAR 271 JSMAX 186 SMAX 9.7990E-09 X(JSMAX) 9.8521E-01
DTPP 2.4069E-07 OTPULS -4.7737E+03 EMVNEG EMVPOS 4.6603E+03 EMVPR 1.2057E+03 EMVPP PDTPOS 0. PDTNEG
X(1) X(JBND1) X(JBND3) X(JFIN) JQMAX 28 X(JQMAX) 2.8669E-01
-7.7412E-02 3.0169E-01 0. 4.5037E+00 2.9214E+06

REZONE AT CYCLE 1275 ADDED 22 ZONES DELETED 0 ZONES NEW JSTAR IS 293

CYCLE 1300
TIME 1.2186E-06 DTNH 1.9543E-09 ETOTAL 9.7750E+01 JTS 8 JFIN 313 JSTAR 293 JSMAX 195 SMAX 9.5981E-09 X(JSMAX) 1.0120E+00
DTPP 2.4423E-07 OTPULS -4.7086E+03 EMVNEG EMVPOS 4.6452E+03 EMVPR 1.2371E+03 EMVPP PDTPOS 0. PDTNEG
X(1) 1.1536E-07 X(JBND1) X(JBND3) X(JFIN) JQMAX 27 X(JQMAX) 2.7553E-01
-0.0606E-02 3.0372E-01 0. 4.5037E+00 4.1784E+08

CYCLE 1325
TIME 1.2436E-06 DTNH 1.9543E-09 ETOTAL 9.7757E+01 JTS 8 JFIN 313 JSTAR 294 JSMAX 205 SMAX 9.4085E-09 X(JSMAX) 1.0399E+00
DTPP 2.4797E-07 OTPULS -4.6962E+03 EMVNEG EMVPOS 4.6327E+03 EMVPR 1.2116E+03 EMVPP PDTPOS 0. PDTNEG
X(1) 1.1909E-07 X(JBND1) X(JBND3) X(JFIN) JQMAX 27 X(JQMAX) 2.7510E-01
-0.3886E-02 3.0375E-01 0. 4.5037E+00 4.2436E+08

REZONE AT CYCLE 1325 ADDED 0 ZONES DELETED 29 ZONES NEW JSTAR IS 265

CYCLE 1350
TIME 1.3325E-06 DTNH 1.9542E-09 ETOTAL 9.7765E+01 JTS 8 JFIN 284 JSTAR 265 JSMAX 184 SMAX 9.0731E-09 X(JSMAX) 1.0608E+00
DTPP 2.5547E-07 OTPULS -4.6493E+03 EMVNEG EMVPOS 4.6259E+03 EMVPR 1.2293E+03 EMVPP PDTPOS 0. PDTNEG
X(1) 1.3549E-07 X(JBND1) X(JBND3) X(JFIN) JQMAX 24 X(JQMAX) 2.5921E-01
-8.7115E-02 3.0375E-01 0. 4.5037E+00 3.2972E+06

REZONE AT CYCLE 1350 ADDED 24 ZONES DELETED 0 ZONES NEW JSTAR IS 289

CYCLE 1375
TIME 1.3413E-06 DTNH 1.9542E-09 ETOTAL 9.7769E+01 JTS 8 JFIN 308 JSTAR 289 JSMAX 190 SMAX 8.8111E-09 X(JSMAX) 1.0927E+00
DTPP 2.6183E-07 OTPULS -4.6402E+03 EMVNEG EMVPOS 4.6184E+03 EMVPR 1.2069E+03 EMVPP PDTPOS 0. PDTNEG
X(1) 1.2486E-07 X(JBND1) X(JBND3) X(JFIN) JQMAX 24 X(JQMAX) 2.5779E-01
-0.0349E-02 3.0340E-01 0. 4.5037E+00 2.3760E+08

CYCLE 1400
TIME 1.4302E-06 DTNH 1.9542E-09 ETOTAL 9.7773E+01 JTS 8 JFIN 308 JSTAR 290 JSMAX 199 SMAX 8.6437E-09 X(JSMAX) 1.1204E+00
DTPP 2.6534E-07 OTPULS -4.6716E+03 EMVNEG EMVPOS 4.6075E+03 EMVPR 1.1835E+03 EMVPP PDTPOS 0. PDTNEG
X(1) 1.2442E-07 X(JBND1) X(JBND3) X(JFIN) JQMAX 23 X(JQMAX) 2.4193E-01
-0.3581E-02 3.0383E-01 0. 4.5037E+00 1.4282E+08

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CYCLE      TIME        ETOTAL      JFIN    JSTAR    JSMAX      X(JSMAX)
1425    1.679E-06    9.7774E-01    308     290      208       1.1491E+00
DTPP    DTPVLS       EMVPL         EMVPR   EMVPP    EMVBM      PDTNEG
1.1175E-07  -4.6468E-07  1.1323E+03  1.1484E+03  2.2807E+03   0.
X(1)    X(JFIN3)     X(JFIN)       JQMAX   QMAX     X(JQMAX)   PDTPOS
3.0795E-01   0.       4.5037E+00    17      1.9552E-08   1.6357E-01   0.

DEZONE AT CYCLE 1425 ADDED 0 ZONES DELETED 23 ZONES NEW JSTAR IS 267

CYCLE      TIME        ETOTAL      JFIN    JSTAR    JSMAX      X(JSMAX)
1450    1.5400E-06   9.7778E-01    285     268      195       1.1820E+00
DTPP    DTPVLS       EMVPL         EMVPR   EMVPP    EMVBM      PDTNEG
1.1805E-07  -4.7306E-07  1.1261E+03  1.1415E+03  2.2676E+03   0.
X(1)    X(JFIN3)     X(JFIN)       JQMAX   QMAX     X(JQMAX)   PDTPOS
3.0384E-01   0.       4.5037E+00    16      3.6521E-08   1.8628E-01   0.

DEZONE AT CYCLE 1450 ADDED 20 ZONES DELETED 0 ZONES NEW JSTAR IS 297

CYCLE      TIME        ETOTAL      JFIN    JSTAR    JSMAX      X(JSMAX)
1475    1.6415E-06   9.7754E-01    314     297      205       1.2164E+00
DTPP    DTPVLS       EMVPL         EMVPR   EMVPP    EMVBM      PDTNEG
1.6226E-07  -4.7293E-07  1.1276E+03  1.1252E+03  2.2525E+03   0.
X(1)    X(JFIN3)     X(JFIN)       JQMAX   QMAX     X(JQMAX)   PDTPOS
3.0391E-01   0.       4.5037E+00    16      5.9205E-08   1.8551E-01   0.

CYCLE      TIME        ETOTAL      JFIN    JSTAR    JSMAX      X(JSMAX)
1500    1.6631E-06   9.7751E-01    314     298      215       1.2519E+00
DTPP    DTPVLS       EMVPL         EMVPR   EMVPP    EMVBM      PDTNEG
1.6750E-07  -4.7249E-07  1.1421E+03  1.0950E+03  2.2371E+03   0.
X(1)    X(JFIN3)     X(JFIN)       JQMAX   QMAX     X(JQMAX)   PDTPOS
3.0386E-01   0.       4.5037E+00    16      4.8837E-08   1.8472E-01   0.

CYCLE      TIME        ETOTAL      JFIN    JSTAR    JSMAX      X(JSMAX)
1525    1.7245E-06   9.7772E-01    314     298      224       1.2850E+00
DTPP    DTPVLS       EMVPL         EMVPR   EMVPP    EMVBM      PDTNEG
1.6868E-07  -4.7218E-07  1.1275E+03  1.0946E+03  2.2221E+03   0.
X(1)    X(JFIN3)     X(JFIN)       JQMAX   QMAX     X(JQMAX)   PDTPOS
3.0386E-01   0.       4.5037E+00    15      2.7410E-08   1.6142E-01   0.

DEZONE AT CYCLE 1525 ADDED 27 ZONES DELETED 26 ZONES NEW JSTAR IS 299

CYCLE      TIME        ETOTAL      JFIN    JSTAR    JSMAX      X(JSMAX)
1550    1.7862E-06   9.7744E-01    315     300      207       1.3193E+00
DTPP    DTPVLS       EMVPL         EMVPR   EMVPP    EMVBM      PDTNEG
1.5339E-07  -4.7197E-03  1.1281E+03  1.0798E+03  2.2079E+03   0.
X(1)    X(JFIN3)     X(JFIN)       JQMAX   QMAX     X(JQMAX)   PDTPOS
3.1306E-01   0.       4.5037E+00    13      1.6227E-08   1.4683E-01   0.

CYCLE      TIME        ETOTAL      JFIN    JSTAR    JSMAX      X(JSMAX)
1575    1.8306E-06   9.7722E-01    315     300      216       1.3546E+00
DTPP    DTPVLS       EMVPL         EMVPR   EMVPP    EMVBM      PDTNEG
1.5037E-07  -4.7146E-03  1.1402E+03  1.0531E+03  2.1932E+03   0.
X(1)    X(JFIN3)     X(JFIN)       JQMAX   QMAX     X(JQMAX)   PDTPOS
3.1226E-01   0.       4.5037E+00    20      2.0517E-08   2.7019E-01   0.
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CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN      JSTAR      JSMAX      SMAX        X(JSMAX)
1600   1.9093E-06   2.4625E-09     3     9.7711E-01     315       301        224     6.9970E-09   1.3971E+00
DTPP       DTPULS      EMVNEG     EMVPOS    EMVPL       EMVPR     EMVPP      EMVBM     PDTPOS      PDTNEG
1.5984E-07  -4.7182E-03          4.5771E+03 1.1184E+03 1.0608E+03                      0.          0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3)   X(JFIN)    JQMAX    QMAX      X(JQMAX)
3.1144E-07                -1.2530E-01    0.      4.5037E+00   20    3.6563E-08  2.6923E-01

REZONE AT CYCLE 1600 ADDED 22 ZONES DELETED 0 ZONES   NEW JSTAR IS 323

CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN      JSTAR      JSMAX      SMAX        X(JSMAX)
1625   1.9709E-06   2.4625E-09     3     9.7705E+01     337       323        232     6.8191E-09   1.4206E+00
DTPP       DTPULS      EMVNEG     EMVPOS    EMVPL       EMVPR     EMVPP      EMVBM     PDTPOS      PDTNEG
5.1663E-07  -4.7182E-03          4.5771E+03 3.5229E+03 1.0570E+03                      0.          0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3)   X(JFIN)    JQMAX    QMAX      X(JQMAX)
6.7164E-07                -1.2933E-01    0.      4.5037E+00   20    3.7639E+08  2.6830E-01

REZONE AT CYCLE 1625 ADDED 0 ZONES DELETED 26 ZONES   NEW JSTAR IS 297

CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN      JSTAR      JSMAX      SMAX        X(JSMAX)
1637   2.0000E-06   2.4486E-09     3     9.7709E+01     311       297        210     6.7296E-09   1.4377E+00
DTPP       DTPULS      EMVNEG     EMVPOS    EMVPL       EMVPR     EMVPP      EMVBM     PDTPOS      PDTNEG
5.2554E-07  -4.7182E-03          4.5771E+03 3.5367E+03 1.0432E+03                      0.          0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3)   X(JFIN)    JQMAX    QMAX      X(JQMAX)
6.8056E-07                -1.3131E-01    0.      4.5037E+00   16    3.8154E+08  2.3591E-01

CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN      JSTAR      JSMAX      SMAX        X(JSMAX)
1650   2.0320E-06   2.4625E-09     3     9.7716E+01     311       298        214     6.6460E-09   1.4550E+00
DTPP       DTPULS      EMVNEG     EMVPOS    EMVPL       EMVPR     EMVPP      EMVBM     PDTPOS      PDTNEG
5.3259E-07  -4.7182E-03          4.5771E+03 3.5396E+03 1.0402E+03                      0.          0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3)   X(JFIN)    JQMAX    QMAX      X(JQMAX)
6.8911E-07                -1.3342E-01    0.      4.5037E+00   16    3.5333E+08  2.3556E-01

CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN      JSTAR      JSMAX      SMAX        X(JSMAX)
1675   2.0936E-06   2.4625E-09     3     9.7729E+01     311       298        222     6.4611E-09   1.4905E+00
DTPP       DTPULS      EMVNEG     EMVPOS    EMVPL       EMVPR     EMVPP      EMVBM     PDTPOS      PDTNEG
5.5140E-07  -4.7182E-03          4.5771E+03 3.5627E+03 1.0170E+03                      0.          0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3)   X(JFIN)    JQMAX    QMAX      X(JQMAX)
7.0480E-07                -1.3750E-01    0.      4.5037E+00   16    3.1681E+08  2.3493E-01

CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN      JSTAR      JSMAX      SMAX        X(JSMAX)
1700   2.1551E-06   2.4625E-09     3     9.7741E+01     311       298        229     6.3171E-09   1.5225E+00
DTPP       DTPULS      EMVNEG     EMVPOS    EMVPL       EMVPR     EMVPP      EMVBM     PDTPOS      PDTNEG
5.6192E-07  -4.7182E-03          4.5771E+03 3.5497E+03 1.0299E+03                      0.          0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3)   X(JFIN)    JQMAX    QMAX      X(JQMAX)
7.2495E-07                -1.4157E-01    0.      4.5037E+00   16    2.1171E+08  2.3420E-01

REZONE AT CYCLE 1700 ADDED 22 ZONES DELETED 0 ZONES   NEW JSTAR IS 320

CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN      JSTAR      JSMAX      SMAX        X(JSMAX)
1725   2.2167E-06   2.4420E-09     3     9.7754E+01     333       321        236     6.1440E-09   1.5553E+00
DTPP       DTPULS      EMVNEG     EMVPOS    EMVPL       EMVPR     EMVPP      EMVBM     PDTPOS      PDTNEG
5.7705E-07  -4.7182E-03          4.5771E+03 3.5454E+03 1.0342E+03                      0.          0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3)   X(JFIN)    JQMAX    QMAX      X(JQMAX)
7.4538E-07                -1.4565E-01    0.      4.5037E+00   14    1.7494E+08  1.8022E-01
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REZONE AT CYCLE 1725 ADDED 0 ZONES DELETED 1 ZONES NEW JSTAR IS 320

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	SMAX	X(JSMAX)
1750	2.2782E-06	2.4620E-09	3	.7760E+01	332	320	242	1.5889E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTNEG
7.6496E-07	5.9288E-07	-4.7182E-07	4.5771E+03	.5495E+03	1.0301E+03	4.5796E+03	EMVBM	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	0. X(JQMAX)	PDTPOS
-1.4972E-01	3.0419E-01	0.	0.	.5037E+00	12	2.6104E+08	1.5700E-01	

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	SMAX	X(JSMAX)
1775	2.3398E-06	2.4620E-09	3	.7762E+01	332	321	249	1.6234E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTNEG
7.8374E-07	6.0956E-07	-4.7182E-07	4.5771E+03	.5617E+03	1.0178E+03	4.5795E+03	EMVBM	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	0. X(JQMAX)	PDTPOS
-1.5386E-01	3.0421E-01	0.	0.	.5037E+00	12	2.8495E+08	1.5635E-01	

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	SMAX	X(JSMAX)
1800	2.4013E-06	2.4620E-09	3	.7765E+01	332	321	256	1.6587E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTNEG
8.0351E-07	6.2837E-07	-4.7182E+03	4.5771E+03	.5812E+03	9.9819E+02	4.5796E+03	EMVBM	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	0. X(JQMAX)	PDTPOS
-1.5787E-01	3.0424E-01	0.	0.	.5037E+00	11	2.8392E+08	1.3586E-01	

REZONE AT CYCLE 1800 ADDED 21 ZONES DELETED 0 ZONES NEW JSTAR IS 342

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	SMAX	X(JSMAX)
1825	2.4629E-06	2.4625E-09	3	9.7763E+01	353	343	262	1.6897E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTNEG
8.2505E-07	6.4177E-07	-4.7182E+03	4.5771E+03	3.5620E+03	1.0173E+03	4.5793E+03	EMVBM	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	0. X(JQMAX)	PDTPOS
-1.6195E-01	3.0426E-01	0.	0.	.5037E+00	11	2.2978E+08	1.3527E-01	

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	SMAX	X(JSMAX)
1850	2.5244E-06	2.4625E-09	3	.7758E+01	353	343	269	1.7269E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTNEG
8.4202E-07	6.6079E-07	-4.7182E+03	4.5771E+03	3.5936E+03	9.8565E+02	4.5793E+03	EMVBM	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	0. X(JQMAX)	PDTPOS
-1.6602E-01	3.0428E-01	0.	0.	.5037E+00	275	1.5561E+08	1.7649E+00	

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	SMAX	X(JSMAX)
1875	2.5860E-06	2.4625E-09	3	.7752E+01	353	343	275	1.7651E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTNEG
8.7207E-07	7.1495E-07	-4.7182E+03	4.5771E+03	.7542E+03	8.2504E+02	4.5793E+03	EMVBM	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	0. X(JQMAX)	PDTPOS
-1.7010E-01	3.0430E-01	0.	0.	.5037E+00	8	2.2596E+08	5.2717E-02	

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	SMAX	X(JSMAX)
1900	2.6476E-06	2.4625E-09	3	.7751E+01	353	344	278	1.7986E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTNEG
9.0586E-07	7.4233E-07	-4.7182E+03	4.5771E+03	.7528E+03	8.2642E+02	4.5792E+03	EMVBM	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	0. X(JQMAX)	PDTPOS
-1.7417E-01	3.0432E-01	0.	0.	.5037E+00	8	2.6924E+08	5.2115E-02	

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CYCLE      TIME        DTNH         JTS    ETOTAL        JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
1925       2.7091E-06  2.4620E-09   3      9.7755E+01    353     344      280      4.9668E+09 1.8212E+00
DTPP       DTPULS      EMVNEG              EMVPOS  EMVPL        EMVPR   EMVPP    EMVBM    PDTPOS     PDTNEG
9.2193E-07 7.4245E-07  -4.7182E+03         4.5771E+03 3.6876E+03  8.9147E+02  4.5791E+03  280     1.        0.
X(1)       X(JBND1)    X(JBND2)            X(JBND3)  X(JFIN)      QMAX    JQMAX   EMVBM
-1.7825E-01 3.0434E-01 0.                  0.       4.5037E+00   2.2862E+08  8    5.1483E-02

CYCLE      TIME        DTNH         JTS    ETOTAL        JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
1950       2.7707E-06  2.4620E-09   3      9.7764E+01    353     345      283      4.8729E+09 1.8561E+00
DTPP       DTPULS      EMVNEG              EMVPOS  EMVPL        EMVPR   EMVPP    EMVBM    PDTPOS     PDTNEG
9.3968E-07 7.5820E-07  -4.7182E+03         4.5770E+03 3.6947E+03  8.8434E+02  4.5790E+03  283     0.        0.
X(1)       X(JBND1)    X(JBND2)            X(JBND3)  X(JFIN)      QMAX    JQMAX   EMVBM
-1.8233E-01 3.0435E-01 0.                  0.       4.5037E+00   1.4053E+08  286    1.8916E+00

REZONE AT CYCLE 1950   ADDED 21 ZONES   DELETED 0 ZONES   NEW JSTAR IS 366

CYCLE      TIME        DTNH         JTS    ETOTAL        JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
1975       2.8322E-06  2.4620E-09   3      9.7774E+01    374     366      286      4.7542E+09 1.8916E+00
DTPP       DTPULS      EMVNEG              EMVPOS  EMVPL        EMVPR   EMVPP    EMVBM    PDTPOS     PDTNEG
9.6316E-07 7.7849E-07  -4.7182E+03         4.5770E+03 -.7058E+03  8.7320E+02  4.5790E+03  286     0.        0.
X(1)       X(JBND1)    X(JBND2)            X(JBND3)  X(JFIN)      QMAX    JQMAX   EMVBM
-1.8646E-01 3.0437E-01 0.                  0.       4.5037E+00   1.3619E+08  289    1.9277E+00

CYCLE      TIME        DTNH         JTS    ETOTAL        JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
2000       2.8938E-06  2.4620E-09   3      9.7784E+01    374     366      289      4.6153E+09 1.9278E+00
DTPP       DTPULS      EMVNEG              EMVPOS  EMVPL        EMVPR   EMVPP    EMVBM    PDTPOS     PDTNEG
9.9213E-07 8.0508E-07  -4.7182E+03         4.5770E+03 3.7203E+03  8.5869E+02  4.5790E+03  289     0.        0.
X(1)       X(JBND1)    X(JBND2)            X(JBND3)  X(JFIN)      QMAX    JQMAX   EMVBM
-1.9040E-01 3.0439E-01 0.                  0.       4.5037E+00   1.2848E+08  292    1.9647E+00

CYCLE      TIME        DTNH         JTS    ETOTAL        JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
2025       2.9553E-06  2.4625E-09   3      9.7792E+01    374     367      291      4.4917E+09 1.9526E+00
DTPP       DTPULS      EMVNEG              EMVPOS  EMVPL        EMVPR   EMVPP    EMVBM    PDTPOS     PDTNEG
1.0194E-06 8.1696E-07  -4.7182E+03         4.5770E+03 3.6695E+03  9.0947E+02  4.5790E+03  291     0.        0.
X(1)       X(JBND1)    X(JBND2)            X(JBND3)  X(JFIN)      QMAX    JQMAX   EMVBM
-1.9455E-01 3.0441E-01 0.                  0.       4.5037E+00   1.2401E+08  295    2.0027E+00

REZONE AT CYCLE 2025   ADDED 0 ZONES   DELETED 91 ZONES   NEW JSTAR IS 276

CYCLE      TIME        DTNH         JTS    ETOTAL        JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
2050       3.0169E-06  2.4625E-09   3      9.7796E+01    283     276      203      4.6240E+09 1.9903E+00
DTPP       DTPULS      EMVNEG              EMVPOS  EMVPL        EMVPR   EMVPP    EMVBM    PDTPOS     PDTNEG
1.0350E-06 8.3478E-07  -4.7182E+03         4.5770E+03 3.6931E+03  8.8573E+02  4.5788E+03  203     0.        0.
X(1)       X(JBND1)    X(JBND2)            X(JBND3)  X(JFIN)      QMAX    JQMAX   EMVBM
-1.9863E-01 3.0442E-01 0.                  0.       4.5037E+00   1.2270E+08  206    2.0285E+00

CYCLE      TIME        DTNH         JTS    ETOTAL        JFIN    JSTAR    JSMAX    SMAX       X(JSMAX)
2075       3.0784E-06  2.4625E-09   3      9.7795E+01    283     276      206      4.3004E+09 2.0287E+00
DTPP       DTPULS      EMVNEG              EMVPOS  EMVPL        EMVPR   EMVPP    EMVBM    PDTPOS     PDTNEG
1.0648E-06 8.6466E-07  -4.7182E+03         4.5770E+03 3.7184E+03  8.6053E+02  4.5789E+03  206     0.        0.
X(1)       X(JBND1)    X(JBND2)            X(JBND3)  X(JFIN)      QMAX    JQMAX   EMVBM
-2.0270E-01 3.0444E-01 0.                  0.       4.5037E+00   1.1721E+08  209    2.0678E+00
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CYCLE     TIME        DTNH           JTS      JFIN      JSTAR      JSMAX      SMAX       X(JSMAX)
2100    3.2400E-06   2.4425E-09       3       283       277        208      4.2100E+09   2.0549E+00
DTPP    DTPULS       EMVNEG        EMVPOS    EMVPR     EMVPP       EMVBM      PDTPOS       PDTNEG
4.7770E-07  -4.7182E+03  4.5770E+03  9.0020E+02  3.6787E+03         0.          0.
X(1)    X(JAND1)     X(JAND2)      X(JRND3)  JQMAX     X(JQMAX)
3.0466E-01  0.           0.                   211      2.0947E+00
-2.0678E-01

CYCLE     TIME        DTNH           JTS      JFIN      JSTAR      JSMAX      SMAX       X(JSMAX)
2125    3.2016E-06   2.4620E-09       3       283       277        211      4.1168E+09   2.0949E+00
DTPP    DTPULS       EMVNEG        EMVPOS    EMVPR     EMVPP       EMVBM      PDTPOS       PDTNEG
9.0166E-07  -4.7182E+03  4.5770E+03  8.6758E+02  3.7112E+03         0.          0.
X(1)    X(JAND1)     X(JAND2)      X(JRND3)  JQMAX     X(JQMAX)
3.0447E-01  0.           0.                   214      2.1355E+00
-2.1085E-01

REZONE AT CYCLE 2125 ADDED 0 ZONES DELETED 88 ZONES NEW JSTAR IS 189

CYCLE     TIME        DTNH           JTS      JFIN      JSTAR      JSMAX      SMAX       X(JSMAX)
2150    3.2631E-06   2.4620E-09       3       195       189        125      4.0220E+09   2.1219E+00
DTPP    DTPULS       EMVNEG        EMVPOS    EMVPR     EMVPP       EMVBM      PDTPOS       PDTNEG
9.1410E-07  -4.7182E+03  4.5770E+03  9.0225E+02  3.6765E+03         0.          0.
X(1)    X(JBND1)     X(JAND2)      X(JBND3)  JQMAX     X(JQMAX)
3.0449E-01  0.           0.                   117      1.9659E+00
-2.1493E-01

CYCLE     TIME        DTNH           JTS      JFIN      JSTAR      JSMAX      SMAX       X(JSMAX)
2175    3.3247E-06   2.4620E-09       3       195       190        128      3.9318E+09   2.1634E+00
DTPP    DTPULS       EMVNEG        EMVPOS    EMVPR     EMVPP       EMVBM      PDTPOS       PDTNEG
9.4489E-07  -4.7182E+03  4.5770E+03  8.6370E+02  3.7151E+03         0.          4.4652E-02
X(1)    X(JBND1)     X(JAND2)      X(JBND3)  JQMAX     X(JQMAX)
3.0451E-01  0.           0.                     8      2.7345E+08
-2.1906E-01

CYCLE     TIME        DTNH           JTS      JFIN      JSTAR      JSMAX      SMAX       X(JSMAX)
2200    3.3862E-06   2.4620E-09       3       195       190        130      3.8598E+09   2.1916E+00
DTPP    DTPULS       EMVNEG        EMVPOS    EMVPR     EMVPP       EMVBM      PDTPOS       PDTNEG
9.5525E-07  -4.7182E+03  4.5770E+03  8.9166E+02  3.6871E+03         0.          4.4652E-02
X(1)    X(JBND1)     X(JAND2)      X(JBND3)  JQMAX     X(JQMAX)
3.0452E-01  0.           0.                     8      3.0843E+08
-2.2304E-01

REZONE AT CYCLE 2200 ADDED 20 ZONES DELETED 0 ZONES NEW JSTAR IS 210

CYCLE     TIME        DTNH           JTS      JFIN      JSTAR      JSMAX      SMAX       X(JSMAX)
2225    3.4478E-06   2.4625E-09       3       215       211        133      3.7299E+09   2.2345E+00
DTPP    DTPULS       EMVNEG        EMVPOS    EMVPR     EMVPP       EMVBM      PDTPOS       PDTNEG
9.9930E-07  -4.7182E+03  4.5770E+03  8.4957E+02  3.7292E+03         0.          4.3659E-02
X(1)    X(JRND1)     X(JAND2)      X(JRND3)  JQMAX     X(JQMAX)
3.0454E-01  0.           0.                     8      2.3755E+08
-2.2715E-01

REZONE AT CYCLE 2225 ADDED 0 ZONES DELETED 32 ZONES NEW JSTAR IS 179

CYCLE     TIME        DTNH           JTS      JFIN      JSTAR      JSMAX      SMAX       X(JSMAX)
2250    3.5093E-06   2.4625E-09       3       183       179        103      3.6812E+09   2.2639E+00
DTPP    DTPULS       EMVNEG        EMVPOS    EMVPR     EMVPP       EMVBM      PDTPOS       PDTNEG
1.0075E-06  -4.7182E+03  4.5770E+03  8.7007E+02  3.7087E+03         0.          9.1467E-02
X(1)    X(JBND1)     X(JAND2)      X(JRND3)  JQMAX     X(JQMAX)
3.0455E-01  0.           0.                    10      1.3666E+08
-2.3123E-01
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CYCLE    2275      TIME  3.5709E-06   DTNH  2.4625E-09   JTS   3   ETOTAL  9.7756E+01   JFIN  183   JSTAR  179   JSMAX  105   SMAX  3.6002E+09   X(JSMAX)  2.2934E+00
DTPP               DTPULS 1.0246E-06  EMVNEG -4.7142E+03  EMVPOS 4.5775E+03  EMVPL 3.6887E+03  EMVPR 8.8999E+02  EMVPP 4.5787E+03  EMVBM  9.0455E-02  PDTPOS 0.  PDTNEG 0.
1.2718E-06   X(1)           X(JAND1)        X(JAND2)           X(JFIN) 3.6887E+03   X(JFIN) 4.5037E+00   QMAX 1.3480E+08   X(JQMAX)
-2.3534E-01                                                                                                              JQMAX  10

CYCLE    2300      TIME  3.6125E-06   DTNH  2.4625E-09   JTS   3   ETOTAL  9.7758E+01   JFIN  183   JSTAR  180   JSMAX  107   SMAX  3.4865E+09   X(JSMAX)  2.3237E+00
DTPP               DTPULS 1.0531E-06  EMVNEG -4.7142E+03  EMVPOS 4.5775E+03  EMVPL 3.6617E+03  EMVPR 9.0692E+02  EMVPP 4.5786E+03  EMVBM            PDTPOS 0.  PDTNEG 0.
1.3135E-06   X(1)           X(JAND1)        X(JAND2)           X(JFIN) 4.5037E+00   QMAX 1.0225E+00   X(JQMAX) 1.6818E-01
-2.3938E-01                                                                                                              JQMAX  12

CYCLE    2325      TIME  3.6940E-06   DTNH  2.4625E-09   JTS   3   ETOTAL  9.7758E+01   JFIN  183   JSTAR  180   JSMAX  110   SMAX  3.4205E+09   X(JSMAX)  2.3696E+00
DTPP               DTPULS 1.0884E-06  EMVNEG -4.7142E+03  EMVPOS 4.5775E+03  EMVPL 3.7230E+03  EMVPR 8.5558E+02  EMVPP 4.5786E+03  EMVBM            PDTPOS 0.  PDTNEG 0.
1.3384E-06   X(1)           X(JAND1)        X(JAND2)           X(JFIN) 4.5037E+00   QMAX 2.3951E+08   X(JQMAX) 1.6753E-01
-2.4345E-01                                                                                                              JQMAX  12

CYCLE    2350      TIME  3.7556E-06   DTNH  2.4620E-09   JTS   3   ETOTAL  9.7757E+01   JFIN  183   JSTAR  180   JSMAX  112   SMAX  3.3597E+09   X(JSMAX)  2.4008E+00
DTPP               DTPULS 1.1047E-06  EMVNEG -4.7142E+03  EMVPOS 4.5775E+03  EMVPL 3.7115E+03  EMVPR 8.6596E+02  EMVPP 4.5785E+03  EMVBM            PDTPOS 0.  PDTNEG 0.
1.3628E-06   X(1)           X(JAND1)        X(JAND2)           X(JFIN) 4.5037E+00   QMAX 3.1304E+08   X(JQMAX) 1.6689E-01
-2.4753E-01                                                                                                              JQMAX  12

CYCLE    2375      TIME  3.8171E-06   DTNH  2.4620E-09   JTS   3   ETOTAL  9.7755E+01   JFIN  183   JSTAR  181   JSMAX  114   SMAX  3.2910E+09   X(JSMAX)  2.4325E+00
DTPP               DTPULS 1.1246E-06  EMVNEG -4.7182E+03  EMVPOS 4.5770E+03  EMVPL 3.7012E+03  EMVPR 8.7731E+02  EMVPP 4.5785E+03  EMVBM            PDTPOS 0.  PDTNEG 0.
1.3912E-06   X(1)           X(JAND1)        X(JAND2)           X(JFIN) 4.5037E+00   QMAX 3.2785E+08   X(JQMAX) 1.6624E-01
-2.5160E-01                                                                                                              JQMAX  12

CYCLE    2400      TIME  3.8787E-06   DTNH  2.4620E-09   JTS   3   ETOTAL  9.7752E+01   JFIN  183   JSTAR  181   JSMAX  116   SMAX  3.2154E+09   X(JSMAX)  2.4647E+00
DTPP               DTPULS 1.1487E-06  EMVNEG -4.7182E+03  EMVPOS 4.5775E+03  EMVPL 3.6936E+03  EMVPR 8.8488E+02  EMVPP 4.5785E+03  EMVBM            PDTPOS 0.  PDTNEG 0.
1.4239E-06   X(1)           X(JAND1)        X(JAND2)           X(JFIN) 4.5037E+00   QMAX 2.9031E+08   X(JQMAX) 1.6566E-01
-2.5568E-01                                                                                                              JQMAX  12

CYCLE    2425      TIME  3.9402E-06   DTNH  2.4620E-09   JTS   3   ETOTAL  9.7747E+01   JFIN  183   JSTAR  181   JSMAX  118   SMAX  3.1380E+09   X(JSMAX)  2.4974E+00
DTPP               DTPULS 1.1750E-06  EMVNEG -4.7182E+03  EMVPOS 4.5775E+03  EMVPL 3.6871E+03  EMVPR 8.9138E+02  EMVPP 4.5785E+03  EMVBM            PDTPOS 0.  PDTNEG 0.
1.4596E-06   X(1)           X(JAND1)        X(JAND2)           X(JFIN) 4.5037E+00   QMAX 2.1769E+08   X(JQMAX) 1.6509E-01
-2.5975E-01                                                                                                              JQMAX  12

CYCLE    2450      TIME  4.0018E-06   DTNH  2.4625E-09   JTS   3   ETOTAL  9.7742E+01   JFIN  183   JSTAR  182   JSMAX  120   SMAX  3.0628E+09   X(JSMAX)  2.5305E+00
DTPP               DTPULS 1.2126E-06  EMVNEG -4.7182E+03  EMVPOS 4.5770E+03  EMVPL 3.6834E+03  EMVPR 8.9506E+02  EMVPP 4.5734E+03  EMVBM            PDTPOS 0.  PDTNEG 0.
1.4949E-06   X(1)           X(JAND1)        X(JAND2)           X(JFIN) 4.5037E+00   QMAX 1.3908E+08   X(JQMAX) 2.5113E-01
-2.6383E-01                                                                                                              JQMAX  15
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 CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN     JSTAR     JSMAX      SMAX      X(JSMAX)
 2475    4.0633E-06  2.4425E-09     3     3.773AF+01    183       182       122     2.9919E+09  2.5641E+00
 DTPP    DTPULS      EMVNEG      EMVPOS    EMVPL       EMVPR     EMVPP     EMVBM     PDTPOS      PDTNEG
 1.5307E-06  1.2302E-06  -4.7182E+03  4.5770E+03  3.6806E+03  8.9779E+02  4.5784E+03            0.          0.
 X(1)    X(JBND1)    X(JBND2?)   X(JBND3)  X(JFIN)     QMAX      JQMAX     X(JQMAX)
-2.679AE-01  2.0464E-01  0.         0.       4.5037E+00  2.2715E+08   15      2.5037E-01

 CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN     JSTAR     JSMAX      SMAX      X(JSMAX)
 2500    4.1249E-06  2.4425E-09     3     9.7734E+01    183       182       124     2.9278E+09  2.5903E+00
 DTPP    DTPULS      EMVIEG      EMVPOS    EMVPL       EMVPR     EMVPP     EMVBM     PDTPOS      PDTNEG
 1.5637E-06  1.2571E-06  -4.7182E-03  4.5770E+03  3.6806E+03  8.9779E+02  4.5784E+03            0.          0.
 X(1)    X(JBND1)    X(JBN'2)    X(JBND3)  X(JFIN)     QMAX      JQMAX     X(JQMAX)
-2.7194E-01  3.0469E-01  0.         0.       4.5037E+00  2.5360E+08   15      2.4959E-01

 REZONE AT CYCLE 2500 ADDED 19 ZONES DELETED 0 ZONES NEW JSTAR IS 201

 CYCLE      TIME        D'NH        JTS      ETOTAL      JFIN     JSTAR     JSMAX      SMAX      X(JSMAX)
 2525    4.1865E-06  2.4625E-09     3     9.7738E+01    202       201       126     2.8682E+09  2.6329E+00
 DTPP    DTPULS      EMVNEG      EMVPOS    EMVPL       EMVPR     EMVPP     EMVBM     PDTPOS      PDTNEG
 1.5963E-06  1.2836E-06  -4.7182E+03  4.5770E+03  3.6815E+03  8.9685E+02  4.5783E+03            0.          0.
 X(1)    X(JBND1)    X(JBND2)    X(JBND3)  X(JFIN)     QMAX      JQMAX     X(JQMAX)
-2.7605E-01  3.0476E-01  0.         0.       4.5037E+00  2.1496E+08   15      2.4883E-01

 CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN     JSTAR     JSMAX      SMAX      X(JSMAX)
 2550    4.2480E-06  2.4620E-09     3     9.7742E+01    202       201       128     2.8134E+09  2.6681E+00
 DTPP    DTPULS      EMVNEG      EMVPOS    EMVPL       EMVPR     EMVPP     EMVBM     PDTPOS      PDTNEG
 1.6273E-06  1.3098E-06  -4.7182E+03  4.5770E+03  3.6849E+03  8.9336E+02  4.5783E+03            0.          0.
 X(1)    X(JBND1)    X(JBND2)    X(JBND3)  X(JFIN)     QMAX      JQMAX     X(JQMAX)
-2.8013E-01  3.0472E-01  0.         0.       4.5037E+00  1.3332E+08   15      2.4810E-01

 CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN     JSTAR     JSMAX      SMAX      X(JSMAX)
 2575    4.3096E-06  2.4620E-09     3     9.7747E+01    202       201       118     2.8003E+09  2.4655E+00
 DTPP    DTPULS      EMVNEG      EMVPOS    EMVPL       EMVPR     EMVPP     EMVBM     PDTPOS      PDTNEG
 1.6349E-06  9.4503E-07  -4.7182E+03  4.5770E+03  2.6464E+03  1.9319E+03  4.5783E+03            0.          0.
 X(1)    X(JBND1)    X(JBND2)    X(JBND3)  X(JFIN)     QMAX      JQMAX     X(JQMAX)
-2.842nE-01  3.0473E-01  0.         0.       4.5037E+00  8.4298E+07   11      1.1931E-01

 CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN     JSTAR     JSMAX      SMAX      X(JSMAX)
 2600    4.3711E-06  2.4620E-09     3     9.7751E+01    202       201       119     2.7984E+09  2.5146E+00
 DTPP    DTPULS      EMVNEG      EMVPOS    EMVPL       EMVPR     EMVPP     EMVBM     PDTPOS      PDTNEG
 1.636nE-06  9.7416E-07  -4.7182E+03  4.5770E+03  2.7261E+03  1.8522E+03  4.5783E+03            0.          0.
 X(1)    X(JBND1)    X(JBND2)    X(JBND3)  X(JFIN)     QMAX      JQMAX     X(JQMAX)
-2.882nE-01  3.0473E-01  0.         0.       4.5037E+00  9.3714E+07   12      1.6139E-01

 CYCLE      TIME        DTNH        JTS      ETOTAL      JFIN     JSTAR     JSMAX      SMAX      X(JSMAX)
 2625    4.4327E-06  2.4620E-09     3     9.7755E+01    202       201       121     2.7999E+09  2.5477E+00
 DTPP    DTPULS      EMVNEG      EMVPOS    EMVPL       EMVPR     EMVPP     EMVBM     PDTPOS      PDTNEG
 1.6351E-06  9.7447E-07  -4.7182E+03  4.5770E+03  2.7284E+03  1.8498E+03  4.5783E+03            0.          0.
 X(1)    X(JQND1)    X(JBND2)    X(JBND3)  X(JFIN)     QMAX      JQMAX     X(JQMAX)
-2.9235E-01  3.0475E-01  0.         0.       4.5037E+00  1.3132E+08   12      1.6079E-01
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CYCLE       TIME        DTNH          JTS        ETOTAL        JFIN         JSTAR        JSMAX        SMAX         X(JSMAX)
2650        4.632E-06   2.6425E-09    3          9.7759E-01    202          201          123          2.7986E+09   2.5819E+00
     DTPP              DTPULS         EMVPOS       EMVPL        EMVPR        EMVPP        EMVBM        PDTPOS       PDTNEG
                       9.7473E-07    -4.7182E+03  4.5770E+03   2.7335E+03   1.8447E+03                0.           0.
     X(1)              X(JBND1)       X(JBND3)     X(JFIN)      JQMAX        JSTAR        X(JQMAX)
1.6359E-06             3.0475E-01     0.           4.5037E+00   12           201          1.6017E-01
-2.9443E-01            3.0475E-01                               QMAX
                                                                1.4113E+08

CYCLE       TIME        DTNH          JTS        ETOTAL        JFIN         JSTAR        JSMAX        SMAX         X(JSMAX)
2675        4.555E-06   2.6425E-09    3          9.7762E-01    202          201          125          2.7959E+09   2.6160E+00
     DTPP              DTPULS         EMVPOS       EMVPL        EMVPR        EMVPP        EMVBM        PDTPOS       PDTNEG
                       9.7970E-07    -4.7182E+03  4.5770E+03   2.7391E+03   1.8391E+03                0.           0.
     X(1)              X(JBND1)       X(JBND3)     X(JFIN)      JQMAX        JSTAR        X(JQMAX)
1.6375E-06             3.0477E-01     0.           4.5037E+00   12           201          1.5955E-01
-3.0050E-01                                                     QMAX
                                                                1.1867E+08

CYCLE       TIME        DTNH          JTS        ETOTAL        JFIN         JSTAR        JSMAX        SMAX         X(JSMAX)
2700        4.617E-06   2.6425E-09    3          9.7764E-01    202          201          128          2.7957E+09   2.6687E+00
     DTPP              DTPULS         EMVPOS       EMVPL        EMVPR        EMVPP        EMVBM        PDTPOS       PDTNEG
                       1.0128E-06    -4.7182E+03  4.5770E+03   2.8316E+03   1.7465E+03                0.           0.
     X(1)              X(JBND1)       X(JBND3)     X(JFIN)      JQMAX        JSTAR        X(JQMAX)
1.6376E-06                           0.           4.5037E+00   12           201          1.5894E-01
-3.0458E-01                                                     QMAX
                                                                7.0486E+07

CYCLE       TIME        DTNH          JTS        ETOTAL        JFIN         JSTAR        JSMAX        SMAX         X(JSMAX)
2725        4.578E-06   2.6425E-09    3          9.7766E-01    202          201          130          2.7909E+09   2.7043E+00
     DTPP              DTPULS         EMVPOS       EMVPL        EMVPR        EMVPP        EMVBM        PDTPOS       PDTNEG
                       1.0186E-06    -4.7182E+03  4.5770E+03   2.8424E+03   1.7358E+03                0.           0.
     X(1)              X(JBND1)       X(JBND3)     X(JFIN)      JQMAX        JSTAR        X(JQMAX)
1.6404E-06                           0.           4.5037E+00   144          201          2.9686E+00
-3.0865E-01                                                     QMAX
                                                                6.3224E+07

REZONE AT CYCLE 2725  ADDED  0 ZONES  DELETED 23 ZONES  NEW JSTAR IS 178

CYCLE       TIME        DTNH          JTS        ETOTAL        JFIN         JSTAR        JSMAX        SMAX         X(JSMAX)
2750        4.740E-06   2.6420E-09    3          9.7767E-01    179          178          109          2.7776E+09   2.7405E+00
     DTPP              DTPULS         EMVNEG       EMVPL        EMVPR        EMVPP        EMVBM        PDTPOS       PDTNEG
                       1.0293E-06    -4.7182E+03  4.5770E+03   2.8561E+03   1.7221E+03                0.           0.
     X(1)              X(JBND1)       X(JBND3)     X(JFIN)      JQMAX        JSTAR        X(JQMAX)
1.6483E-06                           0.           4.5037E+00   123          178          3.0088E+00
-3.1273E-01                                                     QMAX
                                                                6.2589E+07

CYCLE       TIME        DTNH          JTS        ETOTAL        JFIN         JSTAR        JSMAX        SMAX         X(JSMAX)
2775        4.842E-06   2.6420E-09    3          9.7768E-01    179          178          111          2.7643E+09   2.7773E+00
     DTPP              DTPULS         EMVNEG       EMVPL        EMVPR        EMVPP        EMVBM        PDTPOS       PDTNEG
                       1.0385E-06    -4.7182E+03  4.5770E+03   2.8700E+03   1.7075E+03                0.           0.
     X(1)              X(JBND1)       X(JBND3)     X(JFIN)      JQMAX        JSTAR        X(JQMAX)
1.6562E-06                           0.           4.5037E+00   124          178          3.0292E+00
-3.1680E-01                                                     QMAX
                                                                5.9448E+07

CYCLE       TIME        DTNH          JTS        ETOTAL        JFIN         JSTAR        JSMAX        SMAX         X(JSMAX)
2800        4.843E-06   2.6420E-09    3          9.7770E-01    179          178          113          2.7475E+09   2.8145E+00
     DTPP              DTPULS         EMVNEG       EMVPL        EMVPR        EMVPP        EMVBM        PDTPOS       PDTNEG
                       1.0518E-06    -4.7182E+03  4.5770E+03   2.8886E+03   1.6896E+03                0.           0.
     X(1)              X(JBND1)       X(JBND3)     X(JFIN)      JQMAX        JSTAR        X(JQMAX)
1.6661E-06                           0.           4.5037E+00   126          178          3.0699E+00
-3.2088E-01                                                     QMAX
                                                                5.8350E+07
```

CYCLE 2825
TIME 4.9251E-04   DTNH 2.4620E-09   JTS 3   ETOTAL 9.7772E+01   JFIN 179   JSTAR 178   SMAX 2.7343E+09   X(JSMAX) 2.8332E+00
DTPP   DTPULS 1.0311E-06   EMVNEG -4.7182E-03   EMVPOS 4.5770E+03   EMVPL 2.8194E+03   EMVPR 1.7587E+03   EMVPP 4.5781E+03   EMVBM 114   PDTPOS 0.   PDTNEG 0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3) 0.   X(JFIN)   JQMAX 128   X(JQMAX) 3.1119E+00
-3.2495E-01   3.0485E-01   QMAX 5.8073E+07   4.5037E+00   0.   0.

CYCLE 2850
TIME 4.9947E-04   DTNH 2.4625E-09   JTS 3   ETOTAL 9.7774E+01   JFIN 179   JSTAR 178   SMAX 2.7218E+09   X(JSMAX) 2.8716E+00
DTPP   DTPULS 1.0441E-06   EMVNEG -4.7182E-03   EMVPOS 4.5770E+03   EMVPL 2.8419E+03   EMVPR 1.7362E+03   EMVPP 4.5781E+03   EMVBM 116   PDTPOS 0.   PDTNEG 0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3) 0.   X(JFIN)   JQMAX 129   X(JQMAX) 3.1329E+00
-3.2901E-01   3.0485E-01   QMAX 5.5234E+07   4.5037E+00   0.   0.

CYCLE 2875
TIME 5.0682E-04   DTNH 2.4625E-09   JTS 3   ETOTAL 9.7777E+01   JFIN 179   JSTAR 178   SMAX 2.7082E+09   X(JSMAX) 2.9100E+00
DTPP   DTPULS 1.0580E-06   EMVNEG -4.7182E-03   EMVPOS 4.5770E+03   EMVPL 2.8653E+03   EMVPR 1.7128E+03   EMVPP 4.5781E+03   EMVBM 118   PDTPOS 0.   PDTNEG 0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3) 0.   X(JFIN)   JQMAX 131   X(JQMAX) 3.1755E+00
-3.3316E-01   3.0484E-01   QMAX 5.6006E+07   4.5037E+00   0.   0.

CYCLE 2900
TIME 5.1498E-04   DTNH 2.4625E-09   JTS 3   ETOTAL 9.7779E+01   JFIN 179   JSTAR 178   SMAX 2.6931E+09   X(JSMAX) 2.9496E+00
DTPP   DTPULS 1.0741E-06   EMVNEG -4.7182E-03   EMVPOS 4.5770E+03   EMVPL 2.8266E+03   EMVPR 1.6856E+03   EMVPP 4.5781E+03   EMVBM 120   PDTPOS 0.   PDTNEG 0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3) 0.   X(JFIN)   JQMAX 133   X(JQMAX) 3.2187E+00
-3.3718E-01   3.0487E-01   QMAX 5.3815E+07   4.5037E+00   0.   0.

CYCLE 2925
TIME 5.1714E-06   DTNH 2.4625E-09   JTS 3   ETOTAL 9.7780E+01   JFIN 179   JSTAR 178   SMAX 2.6753E+09   X(JSMAX) 2.9891E+00
DTPP   DTPULS 1.0917E-06   EMVNEG -4.7182E-03   EMVPOS 4.5770E+03   EMVPL 2.9207E+03   EMVPR 1.6574E+03   EMVPP 4.5781E+03   EMVBM 122   PDTPOS 0.   PDTNEG 0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3) 0.   X(JFIN)   JQMAX 134   X(JQMAX) 3.2404E+00
-3.4125E-01   3.0484E-01   QMAX 5.2318E+07   4.5037E+00   0.   0.

CYCLE 2950
TIME 5.2329E-06   DTNH 2.4620E-09   JTS 3   ETOTAL 9.7781E+01   JFIN 179   JSTAR 178   SMAX 2.6549E+09   X(JSMAX) 3.0299E+00
DTPP   DTPULS 1.1121E-06   EMVNEG -4.7182E-03   EMVPOS 4.5770E+03   EMVPL 2.9526E+03   EMVPR 1.6256E+03   EMVPP 4.5782E+03   EMVBM 124   PDTPOS 0.   PDTNEG 0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3) 0.   X(JFIN)   JQMAX 136   X(JQMAX) 3.2849E+00
-3.4533E-01   3.0489E-01   QMAX 5.2354E+07   4.5037E+00   0.   0.

CYCLE 2975
TIME 5.2945E-06   DTNH 2.4620E-09   JTS 3   ETOTAL 9.7780E+01   JFIN 179   JSTAR 178   SMAX 2.6308E+09   X(JSMAX) 3.0706E+00
DTPP   DTPULS 1.1348E-06   EMVNEG -4.7182E-03   EMVPOS 4.5770E+03   EMVPL 2.9853E+03   EMVPR 1.5929E+03   EMVPP 4.5782E+03   EMVBM 126   PDTPOS 0.   PDTNEG 0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3) 0.   X(JFIN)   JQMAX 137   X(JQMAX) 3.3072E+00
-3.4940E-01   3.0489E-01   QMAX 5.0713E+07   4.5037E+00   0.   0.

CYCLE 3000
TIME 5.3560E-06   DTNH 2.4620E-09   JTS 3   ETOTAL 9.7778E+01   JFIN 179   JSTAR 178   SMAX 2.6198E+09   X(JSMAX) 3.0916E+00
DTPP   DTPULS 1.1813E-06   EMVNEG -4.7182E-03   EMVPOS 4.5770E+03   EMVPL 2.9292E+03   EMVPR 1.6490E+03   EMVPP 4.5782E+03   EMVBM 127   PDTPOS 0.   PDTNEG 0.
X(1)   X(JBND1)   X(JBND2)   X(JBND3) 0.   X(JFIN)   JQMAX 139   X(JQMAX) 3.3523E+00
-3.5348E-01   3.0491E-01   QMAX 5.0982E+07   4.5037E+00   0.   0.

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CYCLE 3025

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
3025	5.6176E-06	2.6620E-09	3	9.7774E-01	179	178	129	2.6049E+09	3.1336E+00
OTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7576E-06	1.1392E-06	-4.7192E-03	4.5770E+03	2.9675E+03	1.6107E+03	4.5782E+03		0.	0.
	X(1)	X(JBND2)	X(JBND3)	X(JFIN)	QMAX	JQMAX	X(JQMAX)		
-3.5756E-01	3.6492E-01	0.		4.5037E+00	4.9589E+07	140	3.3753E+00		

REZONE AT CYCLE 3025 ADDED 0 ZONES DELETED 35 ZONES NEW JSTAR IS 143

CYCLE 3050

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
3050	5.4791E-06	2.6620E-09	3	9.7769E-01	144	143	96	2.5820E+09	3.1761E+00
OTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7726E-06	1.1439E-06	-4.7192E-03	4.5770E+03	3.0062E+03	1.5720E+03	4.5782E+03		0.	0.
	X(1)	X(JBND2)	X(JBND3)	X(JFIN)	QMAX	JQMAX	X(JQMAX)		
-3.6169E-01	3.6499E-01	0.		4.5037E+00	4.8287E+07	107	3.4211E+00		

CYCLE 3075

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
3075	5.5607E-06	2.6625E-09	3	9.7763E-01	144	143	98	2.5567E+09	3.2193E+00
OTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7907E-06	1.1922E-06	-4.7182E-03	4.5770E+03	3.0480E+03	1.5302E+03	4.5782E+03	7.4331E-02	0.	0.
	X(1)	X(JBND2)	X(JBND3)	X(JFIN)	QMAX	JQMAX	X(JQMAX)		
-3.6571E-01	3.6499E-01	0.		4.5037E+00	7.8990E+07	8	0.		

CYCLE 3080

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
3080	5.5530E-06	2.6625E-09	3	9.7762E-01	144	143	98	2.5629E+09	3.2194E+00
OTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7866E-06	1.1782E-06	-4.7182E-03	4.5770E+03	3.0197E+03	1.5586E+03	4.5782E+03	7.4211E-02	0.	0.
	X(1)	X(JBND2)	X(JBND3)	X(JFIN)	QMAX	JQMAX	X(JQMAX)		
-3.6652E-01	3.6495E-01	0.		4.5037E+00	8.6286E+07	8	0.		

Time: 3×10^{-8} sec

4 . X10^10 ─

3 . X10^10 ─

2 . X10^10 ─

1 . X10^10 ─

0.0 ─

-1 . X10^10 ─

STRESS (DYNES/cm^2)

-.10   40   .90   1.4   19

DISTANCE (cm)

Time: 1.98×10^{-7} sec

4.0 X10^10 ─

3.0 X10^10 ─

2.0 X10^10 ─

1.0 X10^10 ─

0.0 ─

-2.0 X10^10 ─

STRESS (DYNES/cm^2)

-.10   40   .90   24   29

DISTANCE (cm)

63

Time: 3.54 x 10^{-7} sec

Time: 8.5 x 10^{-7} sec

Time: 1.31×10^{-6} sec
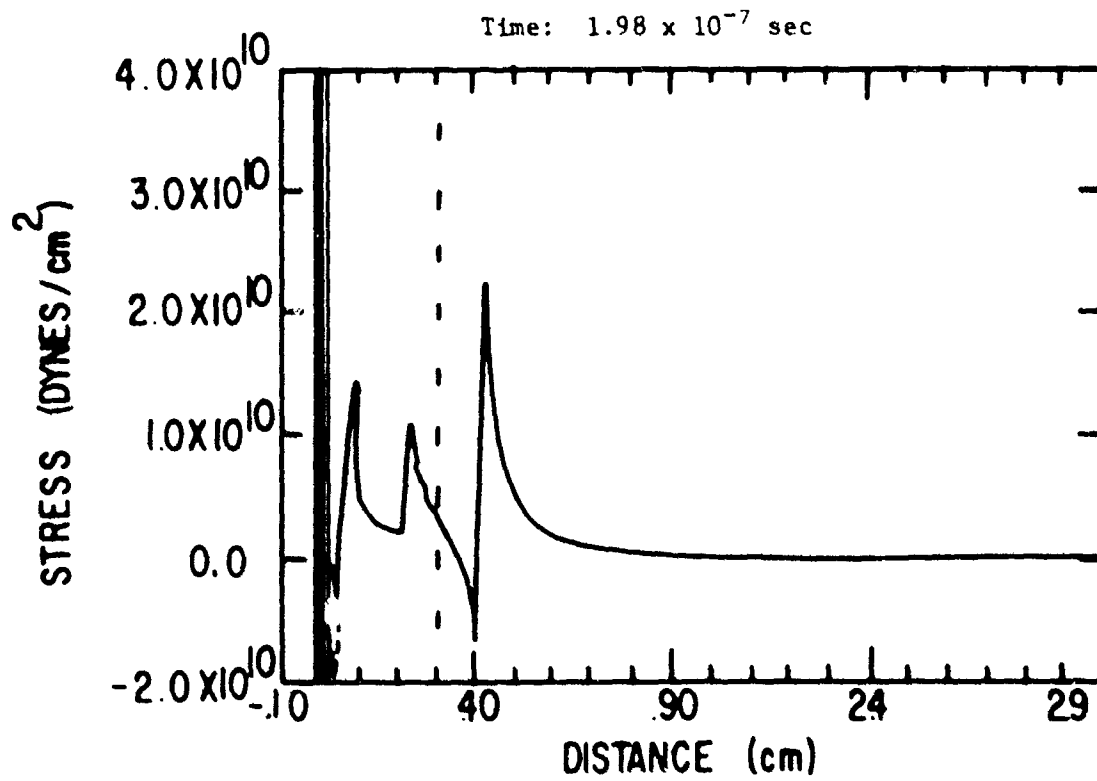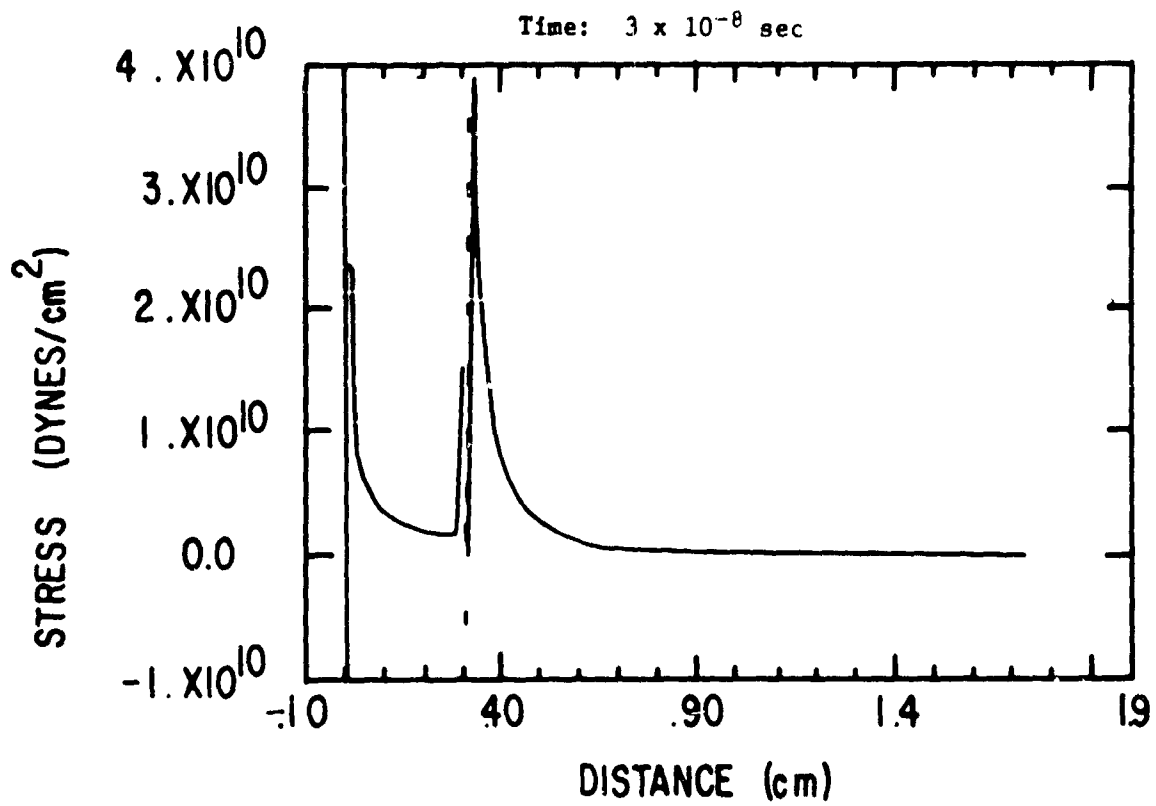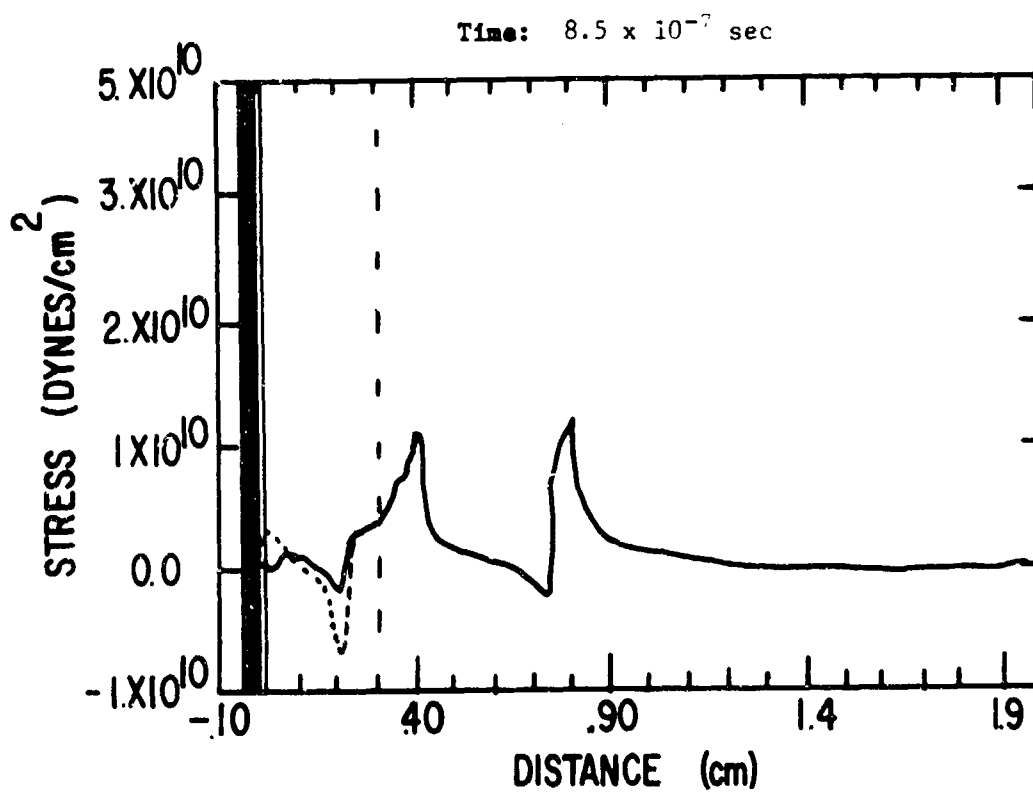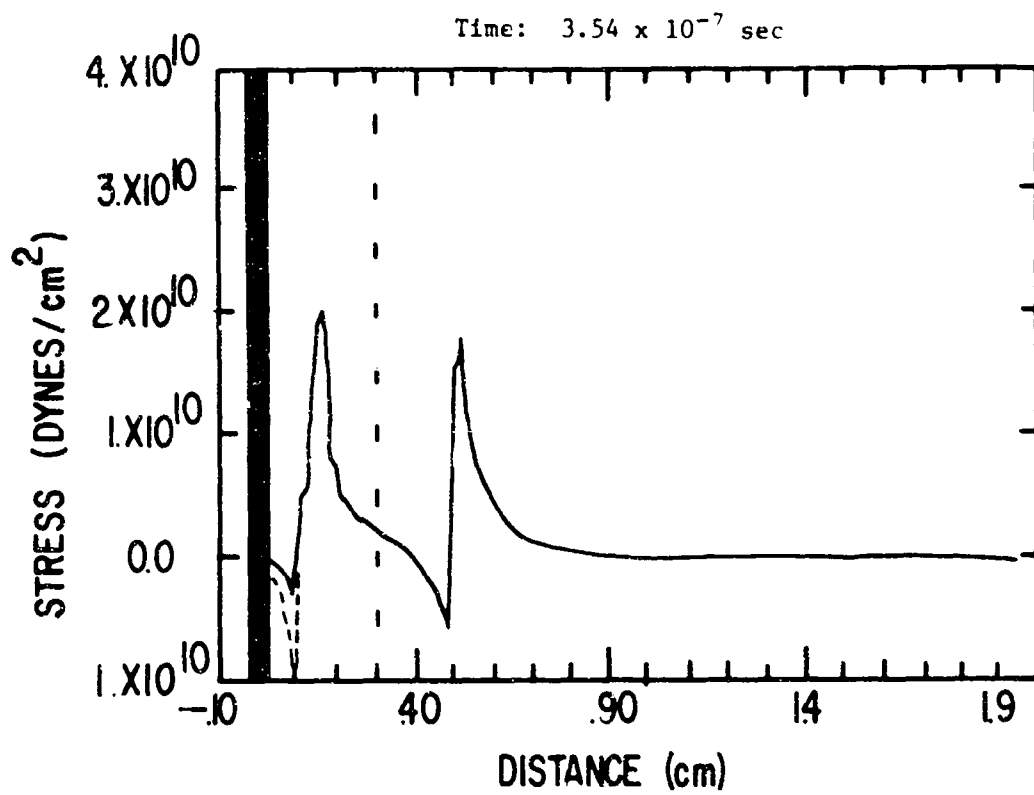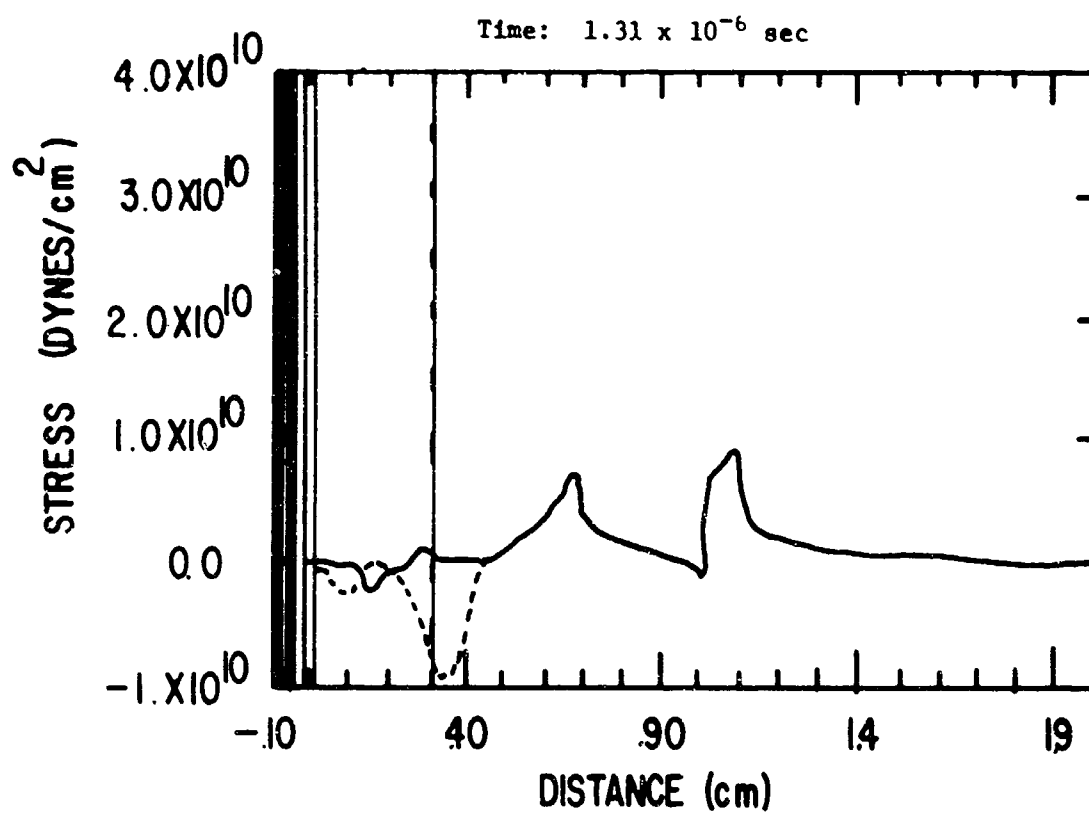
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13. ABSTRACT

(Distribution Limitation Statement No. 2)

This report describes in some detail the addition of a fracture routine to PUFF 66, a one-dimensional Lagrangian hydrodynamics computer program. The report concerns itself mainly with the logic required in creating, following, and deleting free surfaces using a simple tension criterion for fracture plane location.

DD FORM 1 NOV 65 **1473**

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
PUFF 66 Material response Fracture plane						